

ECONOMIC CLIMATE

NO CHANGE IN TREND in the economy can be foreseen for the next few months. The mild dip that shows in total figures is a reflection of intense difficulty in some areas that is almost offset by modest gains (or stability) in others. The U. S. economy is still operating at high levels with relatively stable prices. Though unemployment is a nagging irritant, there is good reason to believe that it will lessen in the near future.

BIGGEST HOPES FOR AN UPTURN are based on continuing strong consumer buying and expanding government demand. More government money is going to be spent for public works, urban renewal, housing programs, highway construction, and defense. This is contributing importantly to business confidence even before any of the new funds have been spent. Awareness that the government is taking steps which will stimulate economic activity is leading businessmen to revise upward their plans for capital spending. As consumer purchasing depletes inventories, stocks will have to be rebuilt. This should lead to a rise in industrial production.

ECONOMIC GROWTH RISE, considered by many to be the nation's best bet to ease depressions, and vice versa, is called for by the National Planning Association. Early in January, NPA went on record in favor of jumping the annual growth rate, currently 2.6-percent, to 7.5-percent in two years, then leveling off to a steady 4.5-percent after 1965.

IN THE UTILITY INDUSTRY, outlook is for an increase in production and shipments of steam turbines and power boilers. Reports to the government indicate that new orders for steam turbines (4000 kw and over) are expected to continue to fall off during the first half of the year. A rise is expected by the end of the third quarter. Shipments this year will rise moderately and the upswing will continue through 1963. Despite a bad 1960, with shipments running 15-percent under the past 10-year annual average, orders on hand assure

that power boiler output in 1961 will be appreciably above 1960 as production makes its first year-to-year gain since 1957. New power boiler orders are expected to rise steeply in the last half of the year. Desire to take advantage of new technological advances and foreign buying account for the good showings to be made by these utility-supplying industries.

MANAGEMENT VIEW

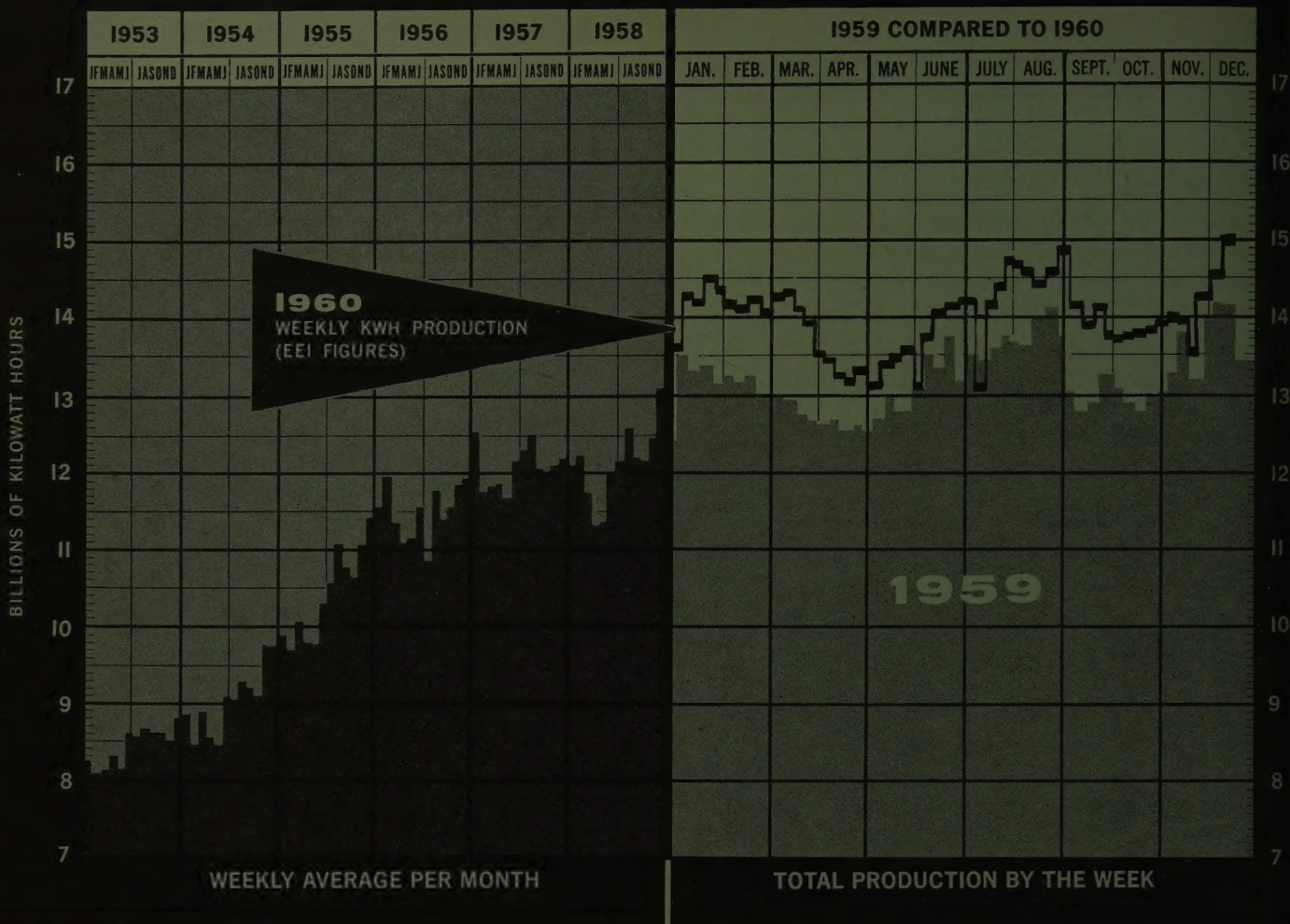
TOTAL TAX TAKE from customers of electric companies in 1960—about \$2.3-billion—was about 24-percent of the total electric bill. EEI's Pres. Sherman R. Knapp compared that with the 3.5-percent paid by the customers of government and cooperative power operations in his early '61 presentation to the N. Y. Society of Security Analysts. His point: If such government-financed power operations were financed on the same basis as the investor-owned electric companies, more than a half-billion dollars in added tax revenue would be available to the Federal, state and local governments.

POWER & LIGHT EXHIBIT, INC., the new corporation formed to conduct the participation of the investor-owned electric industry in the New York 1964-'65 World's Fair, expects to have an exhibit that will convey a strong industry story . . . and will be one of the Fair's principal attractions, according to the corporation's president, Ernest R. Acker, who is board chairman of Central Hudson G.&E. Co.

PACIFIC NORTHWEST OUTLOOK has never been brighter, Bonneville Power Administration's Wm. A. Pearl, told a recent BPA customer conference. "Never in history have we faced a brighter outlook for sound and continuing development of all aspects of our regional economy. The power potential of next ten years that lies in Canadian storage, atomic energy and hydro projects under construction or for which licenses have been applied for, will probably never be equaled," believes the Administrator.

Electric Utility Barometer

(Source: Edison Electric Institute)



NEWS IN PERSPECTIVE

TO JOIN TOGETHER and integrate the power resources and development programs of our two neighboring systems is in the best interest of all concerned, directors of the California Oregon Power Co. and Pacific P.&L. Co. concluded, agreeing at year's end on a merger of the two utilities. (In the "surviving firm," Board Chairman Paul B. McKee and Pres. D. R. McClung would be joined by COPCO Pres. A. S. Cummins and other officers and directors in a merged PP&L management structure.) With a 5-year \$243-million construction program behind them, the new organization anticipates a ten-year building plan at a cost of \$500-million more, to double the present utility plant investment.

UPPER MISS' POWER POOL, coordinating facilities of five power suppliers serving parts of five mid-west states, is the latest voluntary formation of U. S.

utilities. After several years of effort, Otter Tail Pwr. Co., Northern States Pwr. Co., Interstate Pwr. Co., Minnesota P. & L. Co. and the Dairyland Power Coop have put together their 3,100,000-kw of generating capability "to further assure a dependable supply of power for the area . . . and to introduce new operating efficiencies for the most economical production and distribution of electric power to customers of the five pool members," according to a Jan. 6 announcement.

NEW MONEY FINANCING by electric and gas utilities in 1960 dropped to the lowest total in four years—an estimated \$2.673-billion (of which 65-percent was electric). At the outset of '60, only seven-percent of utilities anticipated any difficulty in the financing area; less competition in the money market helped prove their view.

WASHINGTON INFLUENCE

SHARP CRITICISM OF FPC by President Kennedy's expert on regulatory agencies, James M. Landis, will not result in swift remedial action by Congress. There's much feeling that these bodies need less domination by the White House, not additional policy guidance from the Executive branch. Chances are good, however, that the streamlining and modernization urged both by Landis and by the House Legislative Oversight Subcommittee will receive serious and favorable consideration.

REACTION TO LANDIS' suggestions included these comments—From FPC (via one "spokesman"): "There's no doubt the record contains much valuable criticism." From N. Y. investment bankers: Re the SEC—less red tape, fewer lawyers, easier distribution of high-grade securities, if the suggestions bear fruit. Meanwhile, in Washington, the House Legislative Oversight Subcommittee called for broad revision of laws governing the operations of major federal regulatory agencies, including the prohibition of off-the-record contacts with FPC by industry officials.

"HIGHLIGHTING 1960," according to Robert A. Bicks, who presided over the Justice Department's Antitrust Division last year, "was the successful prosecution of the largest group of related criminal and civil anti-trust cases ever brought under the Sherman Act." A total of 20 indictments, involving yearly sales of about \$1.8 billion, "attacked widespread price-fixing and bid-rigging in the heavy electrical equipment industry." Virtually all defendants entered pleas of guilty or nolo contendere. As Bicks sees it, "early solutions" to remaining problems "will insure active price competition in this industry."

TVA HAS PAID \$20,718,198 of its power revenues into the Treasury as its first payment under the revised schedule of payments provided in 1959 bond legislation. An identical amount is to be paid on June 30, when a \$10-million instalment in repayment of appropriated funds invested in TVA power assets will also fall due.

TVA POWER SALES in fiscal 1960 went up 2.1-billion kwh to over 59.3-billion. Operating revenues rose almost \$5-million, to \$242.4-million, at wholesale rates. Federal agencies' purchases of power (mostly the AEC) went up slightly, from 28 billion kwh to 28.3-billion kwh—about 47-percent of TVA's production. TVA system operating expenses rose \$6.1-million to \$192.8-million. Net income from power operations was \$51.1-million. "Net power proceeds" came to \$100-million, composed of net power income plus depreciation.

COUNCIL OF RESOURCE and Conservation Advisers to the President is proposed in legislation sponsored by Sen. Engle (D., Calif.), Rep. Moss (D., Calif.), and others. The measures call for a declaration of national policy on resources, and would have the new 3-man Council coordinate planning for development. The group would also plan ways of dealing with the problem of air pollution, in addition to coping with other resource questions.

63 ELECTRIC UTILITIES have filed three court petitions seeking review of FPC's order concerning their advertising expenses under the ECAP program. FPC had directed that these expenditures be charged to "miscellaneous income deductions" instead of to operating expenses.

LOBBYING EXPENSE RULES may be changed by Congress this year. Though few special tax relief laws are expected to get favorable consideration, there is considerable feeling among legislators that the Internal Revenue Service's present rules are so tight that they may restrict the flow of information to Congress. Any new and more liberal law would, of course, be heavily ringed with safeguards against abuses.

INDUSTRY SIFTINGS

RATE CUTS: 17 TO ONE—That's the record West Penn Power Co. has achieved, with only one rate increase in 1951 to compare with 17 reductions. The latest: a cut of \$513,600 West Penn customers are receiving this month. UNIQUE SWAP: UTILITY CO-OP transfer of assets, okayed recently by SEC, has Mississippi P. & L. Co. trading electric

NEWS IN PERSPECTIVE

distribution lines and related office facilities serving 2600 customers for No. Central Mississippi Elect. Association's distribution lines serving 950 customers in the state's DeSota county.

EHV CAPACITOR BANK—"Largest in the nation" passed trial acceptance tests recently and is now balancing loading on Bonneville Power Administration's 345,000-v transmission system. Builder of the capacitor, General Electric now offers to manufacture even larger banks for EHV transmission.

COAL INDUSTRY'S RESEARCH activities will soon be consolidated in one location—a new million dollar laboratory in E. Pittsburgh, according to Bituminous Coal Research, Inc. BCR's program for development of improved coal utilization methods and equipment will be intensified when the new quarters become available.

REAL ADVANCES ARE NEEDED to allow responsible utility executives to find that a particular nuclear plant under consideration will be more advantageous to the utility for purely practical utility system cost and operating conditions for the specific time and place than any conventional alternative. This need was emphasized by Dr. Frank K. Pittman, the AEC's reactor development division director in remarks for the recent AIF-ANS conferences in San Francisco. (See page 35.)

AETR PROJECT PROGRESS—Kansas G.&E. Co. and its 14 utility company partners are now operating a "critical assembly" that will help determine the amount of fuel, moderator and other materials required in the core of an Advanced Epithermal Thorium Reactor that is the goal of a project being conducted for the Southwest Atomic Energy Associates by Atomic International.

OHIO REA CO-OP has become the eighth such group to repay in full the money it borrowed from the government. Delaware, Ohio, co-op—which received its first loan in 1936—made a final payment on its \$258,000 loan. It has 350 miles of distribution line and serves 1,500 customers.

NATIONAL ELECTRICAL WEEK (Feb. 5-11) is now certain to have the greatest participation ever, the N.E.W. committee reports. In addition to the national-local advertising and publicity in all major media, cooperating industry participants are utilizing every kind of outlet from window displays and slide presentations to electric automobile tours (promoting an exposition's "Highway of Light" and "Highway of Comfort") and "Man in the Moon" contests. Cincinnati G. & E. and the Cincinnati Elect. Assoc. are boosting Electric Living Exposition with the contest, which will select a man to live in a plastic moon suspended over the exhibition.

ELECTRICAL MANUFACTURING PEAK, reached in '60 with a 5-percent hike in that year to a \$22-billion factory output total, may go up another 5-percent . . . hold as is . . . or slip back as much as 5-percent, as NEMA sees the outlook. Considerable caution is in the Association's predictions by Managing Dir. Joseph F. Miller. Yet, there are a number of optimistic signs in the first-of-the-year speculations, too—see page 54. Manufacturers of insulating materials and consumer products are most optimistic, generation, transmission and distribution equipment suppliers the least.

AIR POLLUTION CONTROL EFFORTS in So. California will get "a significant contribution" from arrangements So. California Edison is making to export natural gas from Texas to California via Mexico. The \$225-million pipeline project would also assure the utility of a substantial long-term gas supply at a price more stable than that for present sources, according to the utility's Pres. J. K. Horton. Target date for reliance on this new supply: after July 1, 1962.

FOUND: 13,000 MORE KW—Capability of Seattle City Light's new Gorge Plant will produce that much more power than previously estimated, with completion of a new dam which rises to an elevation of 875-ft. "This increased output will offset additional expenses which result from difficulties encountered in construction and bring the project to about the today's average cost of \$400 per kilowatt," says Lighting Supt. Paul J. Raver.



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MANAGEMENT-MARKETING

West Coast Purchasers Appraise Buyer-Supplier Relationship

PG&E's Johnson: Make Vendor Contacts Pay Off

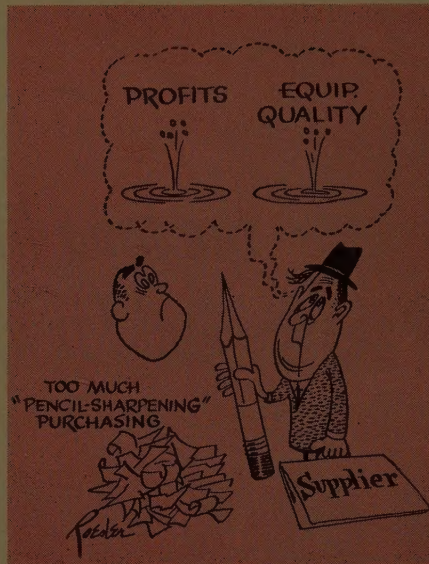
When and how much should utility people in departments other than purchasing "get into the act" of relations with vendors? Another speaker for the recent PCEA-PCGA joint Administrative Services conference led a discussion of this among a half dozen controversial aspects of utility procurement practices today.

W. G. Johnson of the Pacific Gas & Electric Co. observed that in a small organization it may be feasible to restrict vendors' calls to the purchasing department, but not in the large companies. He urged purchasing officials to not only permit but to encourage vendors to communicate with specialists in other departments. He added:

"You just don't have the time to run down questions and answers to every technical detail that surrounds your everyday material and equipment acquisitions. You should have no misgivings over referring a vendor to a specialist because of what you are: a vendor relations specialist . . . and one of your main activities is to coordinate." But, Mr. Johnson warned his purchasing colleagues, "You should arrange for and control these discussions and contacts with other departments and you should have a very thoroughly understood policy regarding the responsibility of the other departments involved—both with your own people and the vendor."

Mr. Johnson tackled another sensitive procurement consideration—division of business, acknowledging that most companies do have a "division of business" formula of one kind or another. He noted that such formulas are arrived at by a decision of top management in some companies, by a team or committee arrangement in others. He said: "In

(Continued on page 32)



Cisler Lauds R & D Tie With Utility Suppliers

The financial support power companies have given the manufacturers for their research and development efforts through the ultimate purchase of equipment and supplies is "a mutual and practical approach . . . that has been most effective."

Walker L. Cisler, president of the Detroit Edison Co., expressed this view in a recent "progress through Unity of Action" message delivered in a principal address for the National Conference of Insulation Manufacturers."

Mr. Cisler assured the manufacturers that the electric power systems are following their research and development with intense interest. He stressed the point that their success in improving existing materials, developing new materials . . . and in tailoring the molecule for precise dielectric and mechanical properties would be "most important" to the future of electric power service and continued growth of customer use.

(Continued on page 34)

Arizona's Hill: "Cut Costs"—P. A.'s Engineering Aim

The "one goal" in coordinating efforts of the Purchasing and Engineering departments in a utility company is: to cut costs. And one of the best tools in cutting costs is Value Analysis . . .

Arizona Public Service Company's Raymond Hill underscored this objective in a recent discussion of "Power and Responsibilities of the Purchasing Department," for the annual joint conference of the Administrative Services Section of the Pacific Coast Electrical Association and the Pacific Coast Gas Association.

Mr. Hill declared that the Number One need in purchasing today is for purchasing executives instead of agents.

"Executives are needed among the catalog watchers, the salesmen, the signers of papers," said Mr. Hill. He pointed out that the procurement materials and supplies is a specialized function without which nothing in the world begins—or is ever accomplished.

For a sum-up of the discussion triggered by these key-note talks, see next page.

Yet, Mr. Hill conceded, some management has not given the over-due distinction of considering purchasing executives "on the team," possibly because the role of purchasing has never been defined. Where top management has always recognized Purchasing Departments, individuals have not always been recognized, observed Mr. Hill.

The Arizona P.S. Co. representative stressed especially the growing need for more understanding between departments. Mr. Hill expressed concern for the possibility that Engineering Department might usurp the purchasing function of source selection. "Here

(Continued on page 32)

"Business Practices in Purchasing:" Problem Areas—Out in the Open

The discussions triggered by the introductory remarks of Raymond Lill and W. G. Johnson developed perhaps as uninhibited public appraisals of controversial buyer-supplier relations situations as have never been presented in industry meetings. PCEA-PCGA leaders are to be commended for offering this common meeting ground for a free and uninhibited exchange of ideas on topics of vital interest to both buyer and supplier . . ." as Mr. Johnson described the work-shop. Here is his discussion sum-up:

Sole Source Suppliers

It was generally agreed by the group that purchasing people in the utility business strongly favor multiple sources of supply over sole sources. However, there are a few manufacturers who have proven themselves to be very reliable sole sources and are rendering excellent service on quality products and are continually improving their design. These firms are normally in the "small business" category and deserve recognition for their exceptional characteristics, but are certainly in the minority.

The representative of one utility, which happens to be caught in a booming, expanding community which is relatively isolated geographically, expressed the almost desperate opinion that right now he would welcome any type of supplier—sole source or not—who would just fill his orders with reasonable promptness and reliability. (Conference participants all agreed that this was an exceptional and temporary situation and predicted that this "supplier's paradise" wouldn't last past the first wave of the "gold-rush" and the purchasing agent is given time to organize his expanding department.)

Taking "check bids" to sample the market—particularly when a prior preference exists for a given supplier's product is a poor purchasing policy, it was unanimously agreed. It results in "token" bids from those suppliers not in the

favored position and accomplishes nothing really conclusive. All present subscribed to the theory that all firms on a bid list should have equal opportunities and, all considerations being equal, the low bidder should be awarded the order. They took note of the fact that there are several recognized sources of information regarding market price levels available to the purchasing agent, and it is part of his professional responsibility to keep abreast of market conditions through these recognized conventional sources of information.

Division of Business

Regarding the methods employed in establishing the "division of business," buyers and sellers present all agreed that "we are doing a better job today than in years past." The ingredients in the division of business formula which were most controversial were: "Reciprocity" and the "Human element." The only real conclusion reached was that both of these elements have a definite influence on division of business policies, but that there is a wide range of effect of these two elements on the division of business policies of various companies.

Response to the question as to who establishes division of business in the firms represented was about as follows:

Top Management	10%
Purchasing Management	25%
Purchasing Department	
Policy Group	20%
Purchasing Department	
Generally, with buyer participation	35%
Other	10%

The old practice of top management dictating business awards in the larger companies is rapidly disappearing. However, some of the "old timers" (in purchasing) are still irritated by the memory of these unpleasant and sometimes unfair award ultimatums. The present more ethical and business-like methods are heartily subscribed to by buyer and supplier alike.

No one present offered a formal

system of rating suppliers, although several are looking into the idea.

Confidence of Suppliers

There was a lively discussion regarding information to unsuccessful bidders. The supplier's salesman is required by his supervisor to obtain all of the information he possibly can about a lost bid. The buyer, on the other hand, is charged with the responsibility of security of information. This leads to some conversational sparring matches and the buyer sometimes leaves an erroneous impression with the salesman. This misinformation creates more problems for the salesman than no information. In summary, the salesman wants an honest and frank answer, not "double talk."

Referral of Vendors to Specialists

The Purchasing Departments in most large firms arrange for referral of vendors to specialists and insist on being kept informed. If time permits, these discussions are attended by the buyer; however, this happens in the minority of the firms represented.

The suppliers felt that they should be permitted to explain to and assist specialists in interpreting their pricing handbook formulas without interference from Purchasing. The buyers agree that this is fine if the supplier just "explains" and "interprets" and doesn't sell.

Courtesies to Suppliers

Buyers are beginning to recognize the importance of improving vendor relations and realize this is closely related to good Public Relations. The vendors have long recognized a need for improvement in this area and are happy to see the trend away from the "Desk-pounding Scrooge" and are elated to be treated with respect and courtesy. The over-all effect is a cementing of buyer-seller relationships with a common goal of attaining a better understanding and exerting a consolidated attack on mutual problems.

Johnson—Cont. from p. 30

those instances where Purchasing Department committees set this policy, it's my firm belief that the buyer should have a very loud voice on this committee because he is the man on the 'firing line' who is most familiar with the everyday performance of the supplier. One of the biggest, most diplomatically challenging responsibilities that a buyer has to shoulder is convincing all of his suppliers that each is getting his fair cut of the pie. The reason this is so difficult is because there is no such thing as a satisfied salesman."

Mr. Johnson suggested that these are the cold, hard ingredients of a "Division of Business" recipe, emphasizing that the proportions of these ingredients vary with the taste of the chef so they are not listed according to proportion or importance: (1) Service (day-to-day); (2) Research and Development Contribution; (3) Reliability (year-to-year); (4) Reciprocity; (5) The "human element."

Mr. Johnson offered this advice concerning the allocation of utility business: "I feel that when an annual allocation of business is being established on any commodity, only 80-percent of the business be allotted in advance. Give the buyer the other 20-percent to distribute among the same suppliers to be placed according to his best judgment. Give him the freedom and responsibility of placement but require him to report the reasons for his actions to the planning committee. How better can the suppliers be rewarded or penalized as the case may be for bad and good performance? What better way is there of keeping the planning committee "up to date" on vendor performance?

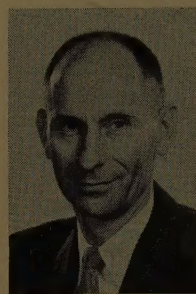
Mr. Johnson also argued the merits of multiple sources of supply:

"Sole source suppliers will sooner or later give the Purchasing Department more problems than multiple sources because: (1) They are more susceptible to service problems; (2) Once established, it's difficult to 'break-up' the combinations that develop; (3) Lack of competition attracts attention and suspicion; and (4) Lack of competition reduces stimulation to advance techniques for improvement

of quality and reduction of cost."

Mr. Johnson also introduced a discussion of the importance of keeping the confidence of suppliers. Briefly, his remarks can be summarized this way:

"When we send out bids for price and delivery on competitive commodities, primarily of materials which are to be fabricated to your design and specification, that request has a different impact on every one of your bidders. No two job shops are alike or are they operating at the same load factor.



W. G. Johnson

If you are fortunate enough to solicit several bidders with available shop space, you are likely to be offered some attractive prices—if you have established yourself as being a reputable buyer who will not divulge the bidder's price to his competitors.

"The wise buyer will conduct himself in a very reliable and confidential manner in his bid negotiations and in so doing, encourage the best prices available in a given market, thereby increasing his value to his company. Conversely, the buyer that earns a reputation of slippery practices or bid-peddling encourages his bidders to match figures before bid time and is very likely to wind up with higher bids that are nearly identical. That buyer is losing his value to his company and his future suffers accordingly."

Mr. Johnson concluded his list of buyer-supplier considerations by describing the concern of his company for extending proper courtesies to suppliers, noting that PG&E had recently defined its company responsibilities in this direction and publishing these in a vendor pamphlet called "Welcome."

(Editor's note: this pamphlet and its purpose were described in EL&P, Sept. 15, 1960, page 49.)

The PG&E representative extended this suggestion: Remember, the salesman's "productive time" amounts to about four hours per day during which time he is doing what he is paid to do—call on buyers.

Hill—Cont. from p. 30

a situation where the Purchasing executive moves into his job importance by being able to reason, decide and procure—but with good sound talk and understanding before and during and after construction."

Mr. Hill listed these objectives in assuring the effective functioning of a utility purchasing department:

1. Purchasing Departments must be flexible—capable of facing unusual situations—change. Purchasing can not, must not have its flexibility hampered or its new ideas squelched. Purchasing Departments can encourage and often do produce items the manufacturer never dreamed about until a need or a suggestion arose.

2. Value Analysis is one of Purchasing's best tools in cutting costs. Our department at Public Service is always in constant contact with other departments. We work closely with the Engineering Department so that new ways can be found, and better materials substituted for the old . . . with one goal: to cut costs. We make this work by having a co-ordinator working between Engineering and Purchasing.

3. Stores and Inventory control should be under the Purchasing Department at all times. Purchasing should be responsible for all materials and supplies, whatever they are—from the time they are ordered until they are used.

4. Automation has many answers for companies with large purchasing departments. Immediate analysis and reporting is possible with automation.

5. Purchasing executives should see that reports are given to management on market conditions, price trends and general conditions as a whole. The operating cost of the department should be analyzed and reported. Savings which the Purchasing Department has made should be reported along with any large commitments.

Mr. Hill concluded with this advice to his colleagues in the function of purchasing:

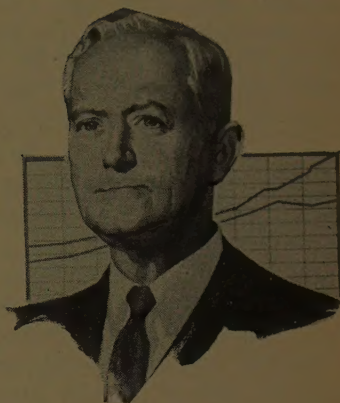
Start cooking up a storm of good public relations—not only with top management, but with every employee—and with the salesmen—and the manufacturers.

An Economic Forecast for 1961

—and the Years Ahead

ECONOMIC OUTLOOK

PREDICTION: NEXT 4 YEARS—*General business prosperity lies ahead, but this will be followed by the development of the most serious economic crisis that America has had to face since the year 1929.*



By A. C. FARMER

Economic problems demanding immediate attention in 1961 will include—

1. Steps to prevent further loss of the gold stock of America.
2. Steps to stimulate the production of goods and services—and thereby reduce unemployment.

Economic problems that will become increasingly pressing in the years ahead include—

1. Dangerous developments from the continued use of credit employed today on an excessive scale. In the next five years the accumulation of private debt will threaten to overwhelm the American economy.
 2. The rapid increase in state and municipal taxation, which threatens in five years to equal or exceed federal taxation.
 3. The creation of additional money (deposits) to offset the deflationary developments of foreclosure and bankruptcy that will threaten the economy. The end of the next five years could lead to a flight from the dollar as savings are transferred to equities. This will accelerate a rapid depreciation of the purchasing power of the dollar.
- The above conclusions most easily can be supported by the questions and answers that follow.

QUESTION—

What action can be taken to prevent the continued loss of the American gold stock?

ANSWER—

Economists feel that many ways are available to stop the outflow of gold. Increase exports, decrease travel abroad, decrease spending by government personnel, supply credit to be spent only in the United States instead of dollars. As these methods are employed, in whole or in part, the gold outflow will cease. The gold problem is not a serious problem.

QUESTION—

What can be done to stimulate business activity?

ANSWER—

The most effective way would be to reduce interest rates and thereby encourage borrowing and spending. Although low interest rates and the control of the gold outflow are antithetical, such action will be taken by the new Administration. Business activity will be stimulated and will continue upward for the next four years.

QUESTION—

How fast is private debt expanding, and why is this a threat to the stability of the economy?

ANSWER—

Since the end of World War II, private debt has expanded about \$30 billion per year, or \$2.5 billion per month. The trend line shows a growth rate of about 10 percent cumulative.

If the private debt expands faster than the normal growth of the economy, which is less than 5 percent, and faster than the increase in the volume of money in the economy, which is less than 4 percent, a serious climax eventually will occur. In about five years the net private debt could reach \$900 billion. This could be disastrous.

QUESTION—

How fast are state and municipal taxes increasing, and why is this a serious problem?

ANSWER—

Both state and municipal debt and state and municipal taxes have been expanding at a rate of 10 percent per year cumulative. At the present rate of increase, state and municipal taxes will equal federal taxes in about five years. At this point the system will be inoperative and the taxes uncollectible under the law of diminishing returns.

QUESTION—

You picture a crisis in about five years as the private debt, and federal, state and municipal taxes reach unsupportable levels at about the same time?

ANSWER—

That is correct. There is no possibility that credit expansion will be curtailed or that taxes will be reduced. Therefore, the conclusion is inescapable that an economic crisis will develop in about five more years. To deal with this crisis, an excessive amount of money will be created by the then existing Administration, and this will be employed as an anti-deflationary measure. The final effect will be a sharp reduction in the dollar's purchasing power.

"If we can solve the inherent technical problems together, with essential help from the nation's great chemical industry, the future will be that much brighter. The electric power systems can be helpful to you in presenting for your consideration the operating problems of today and the operating needs that will develop in the years ahead."

The Detroit Edison executive declared that the relationships of power systems with materials and equipment suppliers merit special attention. Here is how he summed up this traditional relationship, especially as it involves the reliance of power companies on the manufacturers in this area:

"The manufacturers are to be commended for the vigor with which they have pursued the research, development and construction of improved equipment. Their achievements have received world-wide recognition. They have worked closely with companies that provide electric service to analyze specific needs on the systems. In due course, the power companies have provided situations for testing equipment under operating conditions that could not be set up in the laboratory. The manufacturers have had financial support from the power companies through the ultimate purchase of equipment and supplies. This mutual and practical approach to problems has been most effective.

"It is not exaggeration to say that future progress in power generation, transmission and distribution will depend to a substantial degree upon progress in the development and use of insulating materials," said Mr. Cisler.

Cites Progress, New Goals

"The voltages of main turbine-generators today range between 12-24,000-volts. Improved insulation might make it feasible and useful for us to go to higher voltages. Integrity of insulation is a major concern for the future. As generators increase in size they become longer, the problems of expansion and contraction of the field and stator coils become more serious. As you know, we need insulation

that will stand up to the cycling of expansion and contraction over a period of years without deterioration. A time-consuming and expensive repair job results when insulation fails. As generator sizes increase, the performance of insulating materials is ever a matter of greater concern to the designer. A new, superior insulating material might open up completely new design possibilities.

"Much work has been done on this problem from another angle—the inner cooling of generators with liquids and with gases under pressure. This has permitted the higher loading of coils and the shortening of machines, but nevertheless the temperatures of conductor and insulation are factors with which the designer must reckon.

"In transformers we have problems of heat effects, heat dissipation and voltage distribution. Improved voltage distribution and reduction of insulation at the end of turns have been achieved by improved design and better shielding. It would be helpful if the heat conductivity factor in insulation could be improved and if the insulation could be thinner.

"There is definite evidence of progress in the construction of circuit breakers, going from air and oil to compressed air and then to sulphur hexafluoride. As you well know, the last has proven out as an insulating and quenching medium, which is nonflammable and of high dielectric strength under pressure, but with some slight deterioration under arc. The search for improvement along these lines will certainly continue and it will be needed as we go to higher transmission voltages.

"We are aware of progress in the art of building very large porcelain bushings and strong porcelain insulators for power lines. Here we are faced with problems of mechanical strength more than with insulating properties, but there is definite need for further research in both directions. Very strong and reliable insulators are needed, for example, to support the heavier lines of the future.

"Much valuable work has been done through industry cooperation on the development of high voltage

underground cables. The need for such facilities will increase as service areas develop greater concentrations of population and industry. There is also a growing need for extra high voltage underground cable, and success here depends almost entirely on insulation.

Insulation: Key in High Voltage

Through the cooperation of electric power systems and cable and terminal equipment manufacturers a \$3-million electrical testing station for extra-high voltage underground is in operation at Cornell University. In 1953, when the project was conceived, the upper limit of overhead transmission that appeared to be feasible to engineers was 400,000-volts a-c. Now, companies are testing facilities to handle 75,000-volts; but, we do not have a cable for underground transmission that can carry such voltages, and we are up against serious barriers in their development—the most serious of which is insulation. The need for progress in this direction is great, for the industry is already pushing overhead transmission far beyond the 345,000-volt level in its advance planning.

"Since the war there have been significant developments in distribution. There have been trends to higher distribution voltages, to use of synthetic rubber and plastic coverings for overhead lines, and to bare conductors. As our service areas grow, many economic and customer relations problems affect these lines.

"Generally speaking, the development of new insulations and coverings has permitted the direct burial of distribution cables with substantially improved reliability. The cost of replacing existing overhead lines would be extremely high and far beyond what customers would care to pay for their bills or by separate charges. These developments, however, have opened new possibilities for low cost underground distribution, either buried directly or in ducts, for new residential areas, for trailer parks and other situations. Such cable, particularly if it has improved characteristics and lower cost, will grow in importance," said Mr. Cisler.

LONG-HAUL OPTIMISM may be the best description of the atomic power business, now that it has settled to a realistic stage of private industry development. Compared with a year ago (when poor business and poor prospects dominated conversations and comments), indications of good progress and better expectations ran through the reports from some 1500 persons who attended activities of AIF and ANS in San Francisco in December of 1960. (See report on page 59.) For suppliers to the embryo industry, 1959 had not been so bad, after all (see item below) . . . and for the future, well. In his year-end statement, the president of Westinghouse, Mark Cresap, Jr., said: "the atomic power world has the greatest potential of any area in the electrical industry . . ."

ATOMIC ENERGY BUSINESS—UP: Measured by the value of shipments of products of the atomic industry, business for 1959 was about 50-percent better than it was in 1958. The output of privately owned companies was valued at \$244.9-million in '59, the AEC reported recently.

PROTOTYPE ORGANIC POWER REACTOR "expressions of interest," due at the AEC January 31, were to have included a proposal of specific sites along with descriptive data, plus indications of "ability to utilize willingness to utilize the power produced" by the 50-megawatt (net) plant. The AEC would do the principal financing of the nuclear steam supply system, while the participating utility would provide as a minimum—the site, conventional facilities and five years of operation. Another requirement: utilities were to indicate the earliest dates on which satisfactory financial and other arrangements could be completed . . . and dates on which construction could be expected to begin. Definitive proposals will be requested, as the next step.

PUBLIC UNDERSTANDING of atomic energy is the aim of a new committee of the Atomic Industrial Forum, under the chairmanship of Oliver Townsend, director of the office of atomic development of the state of New York. The group will consider possible AIF contributions to the objective of public acceptance of properly safeguarded nuclear activities.

SPECIAL NUCLEAR MATERIAL transfers must now be recorded on standard AEC forms, used in connection with lease agreements executed with licensees. (At a recent meeting of the Council of State Governments, New York's atomic development director Townsend reported that his state is nearing agreement with the AEC for the transfer to N. Y. of some of the federal agency's regulatory responsibility over nuclear materials in quantities not sufficient to form a critical mass.)

SCOTCH CASE REVIEW by the Supreme Court may be made this month or next, with the provisional con-

struction permit for the Enrico Fermi reactor at stake. Meanwhile, an extension to July 15 granted by the AEC may cover the entire construction period, since plant completion is now expected by mid-'61.

"NON-COMPETITIVE" INSURANCE situation, as found by the American Public Power Association, should be investigated for possible anti-trust law violation, the APPA recommends. The Association's Alex Radin notified government officials in December of this concern, based on experience of the Consumers Public Power Dist., which asserts that it has no alternative but to spend for all-risk nuclear property insurance \$75,000 to \$100,000 more than it believes it requires.

CENTRIFUGE PROCESS TECHNOLOGY is available to qualified U. S. firms under amended AEC regulations covering access to restricted data. In exchange, such firms are required to report patent applications, make available to the AEC all technical data and equipment and grant the AEC a non-exclusive, irrevocable license for any license in this field. Use of the method, at least for producing weapons material, is as many as eight years away, says AEC Chairman McCone.

FUSION: HOT AND LONG—In the field of thermonuclear research, a new record stage was reached at Livermore near the end of 1960, when a deuterium plasma was confined for one-thousandth of a second at the temperature of 35-million degrees centigrade in a new multi-stage magnetic compression mirror machine, producing neutrons of thermonuclear origin.

FIRST AEC CITATION for devoted service in advancing A-power programs was made recently to Casper W. Ooms, a member of the Commission's Patent Compensation Board since 1947.



Stainless steel piping for six out-of-pile experimental loops will handle liquid sodium circulated at 1,300-F. Being used in a two-year test program at GE's facilities in San Jose, Cal., the equipment is developing data for design of sodium-cooled reactor heat transfer systems.



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Today it is known, in popular song and statistically, as "PHILADELPHIA, U. S. A." Fourth city in U. S. population, its progress is fostered by three railroads with five major terminals and 19 general

freight yards, and by one of the nation's major electric utility systems which provides the "muscle" for Philadelphia's industrial growth.

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All That Glitters

Precisely what benefits this country can rely on from proposed Canadian storage projects on the Columbia River, just when those benefits may be expected to materialize, and what segment of the economy will be the principal beneficiary, are matters that seem to be punctuated with an ever-growing question mark.

The Eisenhower Administration, when it announced last October that the U. S. and Canada had reached agreement on basic terms for a treaty to cover joint development of Columbia Basin water resources, hailed the achievement as not only a giant step toward solving the Northwest's long-range flood control problem, but also as a one-package solution to the region's power supply problem for the next decade. Potentially, the initial result of the proposed treaty would be a gain to the U. S. of over 386,000-kilowatts of "low-cost" prime power—including 544,000-kw from Libby Dam, which the U. S. could be allowed to build within five years on the Kootenai River near the Canadian border. Canada could construct within ten years three reservoirs providing 15.5-million acre-feet of storage. Downstream power benefits in the U. S. attributable to such storage would be divided equally between the two countries.

"Other Projects ... Delayed"

A dandy arrangement in many respects, no doubt; but not devoid of some undesirable by-products. The most glaring one—the possible impact by way of delaying proposed power developments in this country—was not long in showing up. Under Secretary of Interior Elmer Bennett advised the Federal Power Commission, which is considering applications for the rival High Mountain Sheep and Nez Perce

projects on the Middle Snake River, that neither project need be undertaken "at the present time and for some years to come." The proposed treaty with Canada, Bennett said, "will permit other major hydro-power development on the Columbia River system and hence the proposed Middle Snake projects can be delayed pending further efforts to resolve the fishery problem."

Sidetracking Not Justified

But Bennett's pitch to FPC was bottomed on an estimate of power needs on the Bonneville system through 1970—an estimate that has been sharply challenged by both public and private power operators in the Northwest—and the availability of Libby Dam power and Canadian storage benefits in 1966. Moreover, the Bonneville estimate is keyed primarily to the requirements of publicly-owned systems, whereas a majority of power consumers in the region are served by private utilities. And in counting available power resources in the area, the estimate drags in as capacity nearly 400,000-kw of reserve generating units, many of which are old, high-cost units.

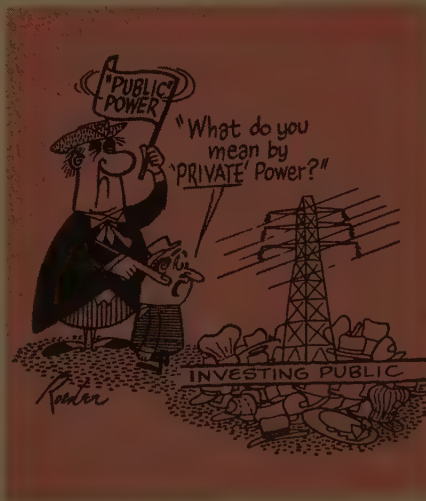
Even assuming the treaty is promptly ratified, it is highly doubt-

ful that its speculative power benefits justify the sidetracking of a project such as High Mountain Sheep, whose sponsor, Pacific Northwest Power Co., insists it can utilize the project's full capacity as soon as it can be built. PNP officials maintain that the downstream power benefits, if and when they become available in the U. S., will take care of only 18 months of growth in the region.

More recently, it has become apparent that the treaty won't get to first base any time soon unless some kind of miraculous healing is applied to a bitter rift between the Dominion and the British Columbia governments over the financing and operating control of the storage projects. The hassle broke into the open when B. C. Premier Bennett declared that the Dominion government's proposal to finance half the cost of the storage dams would result in extra costs to the Province, and Dominion control of the projects plus a share in the profits for their duration. A high Dominion official branded Bennett's statement as "falsifications" aimed at misleading the people of the Province.

The plan at this writing was to get the treaty whipped into final form in time for President Eisenhower to transmit it to the Senate before he leaves office. It is doubtful, however, that prompt ratification will follow. The document will be a complex one, foreshadowing multiple impacts in this country—not the least of which is that American taxpayers may wind up subsidizing power generated for Canadian markets. The Senate likely will want to take a long look at it.

If the final draft conforms to the tentative agreement on basic terms, certainly the treaty can hardly live up to its advance billing as a panacea for Northwest power supply headaches.





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'61

ECONOMIC UPSWING?

... UTILITIES ARE READY



THE ELECTRIC INDUSTRY CONTINUES ITS RECORD-MAKING GROWTH

Key indices of electric-utility performance during 1960 demonstrated substantial advancement toward 1970-80 goals.

EEL REPORTS 1960 ELECTRIC POWER MILESTONES

- Kwh Production: 850-Billion
- U. S. Capability: 175.9-Million Kw
- U. S. Kwh Sales: 667.4-Billion
- Domestic Use (avg.): 3815 Kwh
- Coal Consumption/Kwh: 0.879 lbs.
- Taxes Paid by Investor-Owned Companies Passed \$2.35-Billion Mark
- Electric-plant Investment Was 9.5% of All U. S. Business Investment
- Electric Utilities' Investment: (Private): Now \$46-Billion

CHART DATA: Sources are EEI, U. S. Govt. Agencies and Engineering Consulting Firms; Extrapolations are made by EL&P.



By SHERMAN R. KNAPP
President, Edison Electric Institute, and
President, The Connecticut Light & Power
Company

NEW HIGHS in electric energy output, sales and power-producing capability marked the electric industry's performance records for 1960, a year in which the American economy as a whole followed a somewhat uneven path.

By 1970, investor-owned electric companies plan to have doubled their present capability and their production. By 1980, they expect both capability and production to

be nearly quadrupled.

According to preliminary figures, electric energy output (including imports from Canada) by the total electric utility industry in the contiguous United States (i.e., exclusive of Alaska and Hawaii) is estimated to have reached a record high of 764.8 billion kilowatt-hours during 1960, an expected increase of some 45.3 billion kilowatt-hours or 6.3 percent over 1959.

With the addition of the electricity generated by industrial plants and by railways not contributing to the public supply, and of generation in Alaska and Hawaii, the United States' output is expected to have reached a record total of 850 billion kilowatt-hours in 1960.

Production of electricity within the United States (including Alaska and Hawaii and excluding imports) reached a record high of 850 billion kilowatt-hours.

Capability At New High

In December of 1960 the power-producing capability of the electric industry in the contiguous United States is estimated to have reached a new high of 175.9 million kilowatts. This was an increase of 1.6 million kilowatts, or 7.7 percent over the 1959 figure of 163.3 million kilowatts. Of the industry's total 175.9 million kilowatts of capability, 134.0 million kilowatts, or 76.2 percent

nt were provided by investor-owned companies. The remaining 9 million kilowatts, 23.8 percent of the total, were provided by government-owned or government-financed power agencies. The nation's total electric generating capability, including railway and industrial plants not contributing to the public supply, is estimated to have reached approximately 193 million kilowatts, an increase of some 13 million kilowatts over 1959. Including Alaska and Hawaii, total capability available to the United States is estimated to be about 193.9 million kilowatts.

With an estimated annual peak demand in 1960 of over 139 million kilowatts, the electric industry in the contiguous United States had 56 million kilowatts of reserve capability or a 25.5 percent margin of capability over the estimated annual peak. This margin of reserve is more than the total electric power-producing capability of the nation in the year 1935.

Lead Over USSR Increased

At the close of 1959 the Soviet Union reported a total of 59.1 million kilowatts in electric generating stations. During 1960, an estimated 5 million kilowatts were added, bringing Russia's total generating capability at the end of 1960 to an estimated 66.6 million kilowatts.

Thus, the United States' kilowatt lead over the Soviet Union increased by 6.3 million kilowatts during 1960, from 121 million kilowatts a year ago to 127.3 million kilowatts today.

The amount of electricity used by each person in a nation provides a good indication of the nation's total productive capacity and of the well-being of the people. In 1960, the estimated use was 4716 kilowatt-hours for every man, woman, and child in the United States. In the Soviet Union, estimated use was 1322 kilowatt-hours per capita.

But the real importance of the continued growth of the American electric industry cannot be measured in terms of an economic race with the Soviet Union. The proper measure of the value of the American electric industry is in terms of the benefits electric service has brought, and will increasingly bring, to the American people.

New Construction To Increase

In maintaining their construction programs at the high level needed to meet increasing demands for electricity, the electric companies brought both revenues and employment opportunities to the many industries and enterprises which supply them equipment and materials. The companies' total construction expenditures for the year were \$3.35-billion, bringing the total investment in electric plant and equipment up to approximately \$46-billion at the end of the year.

The electric companies' construction expenditures during 1960 equalled approximately 9.5 percent of all the construction expenditures of American industry during the year. The companies' expenditures on new plant and equipment during 1960 were their fourth largest in history. For 1961 construction expenditures are expected to increase to about \$3.41-billion.

New Highs For Output And Sales

For the seven days ending December 17, the industry produced 15,021,000,000 kilowatt-hours—setting a new record for weekly output. In this one week, the industry produced some 780 million more kilowatt-hours than it had generated during the entire year of 1914.

It is estimated that sales of the electric industry in 1960 reached a new high of 667.4 billion kilowatt hours, and were classified as shown in Table II.

Use of electricity in the American home continued to increase during 1960. Of approximately 1.1 million new customers the electric industry in the contiguous United States added in 1960, about 94 percent were residential and rural customers. Of the total 58.6 million customers served by the industry at the end of the year, approximately 50 million were residential. On the average, the use of electricity by each of these families was 3815 kilowatt-hours—an increase of 230 kilowatt-hours over the previous record in 1959.

Gross revenues for all departments of the investor-owned electric companies in 1960 are expected to reach \$11.5-billion, 6.5 percent higher than the former record of \$10.8-billion set in 1959.

Tax Bill Totals \$2.35-billion

For 1960, it is estimated that the investor-owned electric companies will have a total tax bill on their electric operations of approximately \$2.35-billion—approximately \$160-million more than in 1959. These payments are to all levels of government—Federal, state and local—with the Federal government getting the greatest share.

Had the companies not maintained their record of growth, if their net income had decreased rather than increased, their tax

payments would have been lower. Through these tax payments the strength of the electric companies helps supply sinews to the national defense, and contributes to the functioning of government in other essential areas as well.

Taxes constitute the electric companies' largest single item of expense. During 1960, out of each dollar an electric company customer paid for electricity, 24.1 cents went for taxes. Customers of government-owned and government-financed power agencies, on the other hand, pay only about 3.5 cents out of each dollar they spend for electricity—despite the fact that their electricity is provided with the help of taxes gathered from others.

During the year, electric companies provided employment for approximately 340,000 men and women. For 1960, the electric companies paid out in wages and salaries close to \$1.6-billion, an estimated increase of 3.9 percent over the 1959 figure of \$1.54-billion.

The nation's electric companies purchased about \$1.48-billion worth of coal, oil and gas during 1960,

about 4.2 percent more than the \$1.42-billion spent for this purpose in 1959.

Inflation And Electric Rates

The problems of rising costs for the electric companies have been widely recognized by the regulatory agencies. The commissions continue to recognize the effects of inflation in practically all aspects of operational and capital costs, and the necessity for the financial strength essential to the provision of adequate electric service.

From 1946 through the first 11 months of 1960, according to tabulations of the Edison Electric Institute, there were 597 applications for rate increases involving 226 companies. Of these 597 applications, 536 were granted, 24 are pending, 13 were withdrawn, and 24 denied. The 1960 record to December shows 32 actions. Twenty increases were granted, one was denied and 11 of the 1960 applications are still pending. However, because of the sliding scale nature of the rates the average price per residential kilowatt-hour sold in

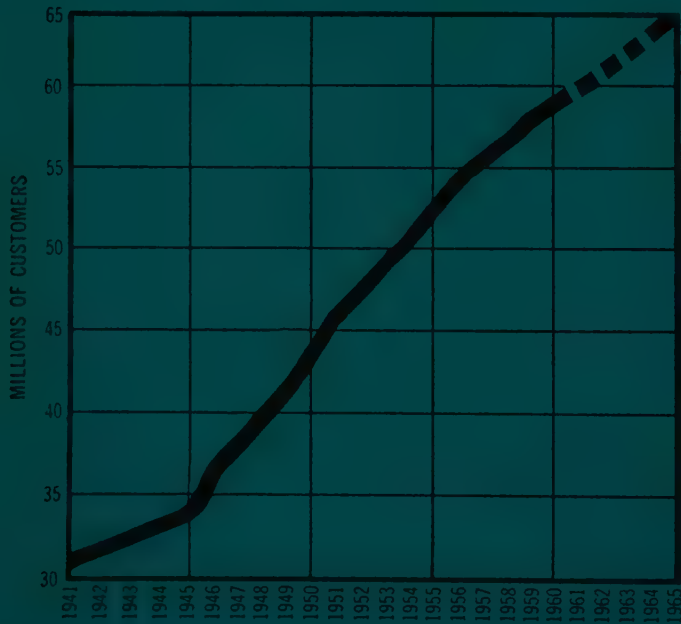
1960 was less than it was in 1959.

Some Predictions For 1961

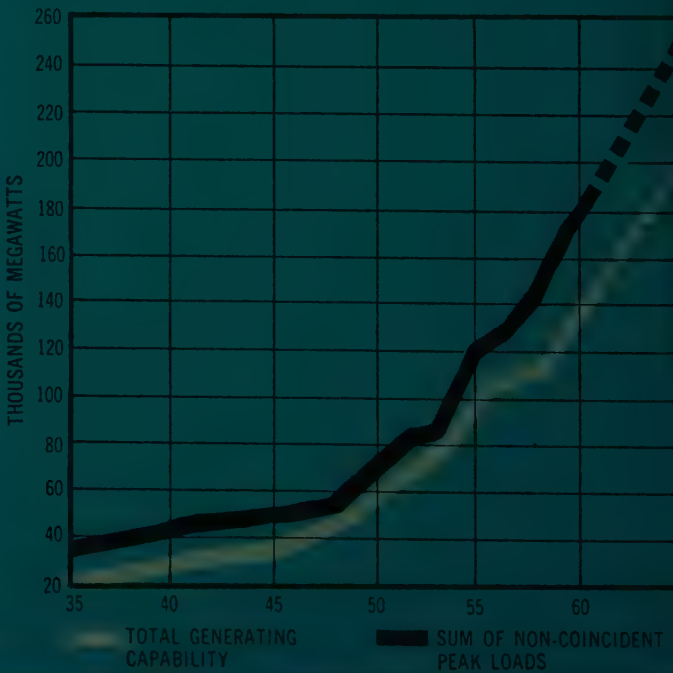
For 1961, the electric companies plan to expend about \$3.41-billion for new plant and equipment. During the year, they plan to add about 7.5 million more kilowatts of generating equipment. Government agencies are expected to add another 3.8 million kilowatts during the year. The expected capability for the total industry in contiguous United States at the end of the year is 187.2 million kilowatts, 6.5 percent over the 1960 figure.

By the end of 1961 electricity output in the United States, including Alaska and Hawaii, is expected to be 7.0 percent higher than in 1960, totaling some 910 billion kilowatt-hours. Sales by all parts of the industry in the contiguous United States are estimated to reach a new peak of 715 billion kilowatt-hours, 7.2 percent over the 1960 record. The number of customers is expected to increase to 59.8 million by the end of the year. The investor-owned companies should increase their revenues by about 6.8 percent over

CUSTOMER GROWTH RECORD



CAPABILITY VS DEMAND



), reaching \$12.25-billion for 1960.

Increased Sales Efforts

Growth of these proportions is achieved without effort. As in the past, the electric companies expect to encourage growth in every way possible. Increased sales efforts in the industrial, commercial, residential and rural areas play a large part in the companies' plans.

One hundred and forty-two companies have joined together to take part in the Live Better Electrically program of the Edison Electric Institute. This national advertising program will have a budget of \$2.6-million in 1961. It will vigorously promote residential use of electricity, with emphasis on the Medallion theme and on the use of major electric appliances. The use of electricity on the farm is to be encouraged through a series of advertisements in major farm journals.

Nuclear Power Progress

During 1960 the electric companies' program for development

of nuclear power made substantial gains. The nuclear power station of the Commonwealth Edison Company-Nuclear Power Group began commercial operation in Dresden, Illinois, during the year. This 180,000-kilowatt station, completely financed through voluntary investment, is the largest atomic plant in the United States.

The Yankee Atomic Electric Company, made up of 11 New England electric companies, completed and put into operation a 136,000-kilowatt nuclear power plant located at Rowe, Massachusetts.

Including the two plants which began operation during the year, five electric company nuclear power plants are now in operation in the United States. Two more are expected to come into operation during 1961, which will bring the total of nuclear-fueled power capacity in the nation to about 760,000 kilowatts by the end of the year.

At the end of 1960 a total of 132 electric power companies were participating in one or more of 26 major projects for the development and construction of atomic power plants and for major research, develop-

ment and study projects. This broad program involves a total utility company investment of over \$650-million.

Research Programs

To meet the power needs of the American people in years to come, the nation's investor-owned electric companies are intensifying their varied research activities. One aspect is reflected in the establishment of a new research division within the EEI organization. This division will be concerned with a number of important research projects of industry-wide interest.

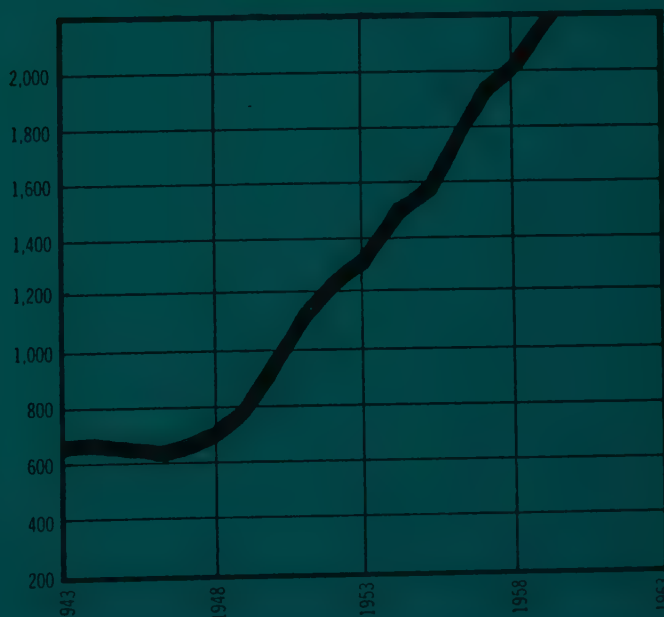
The research efforts of the electric companies are directed towards a multitude of subjects. They include work in all phases of the generation, transmission, distribution and use of electricity. "Exotic" power sources, such as the fuel cell, the thermionic tube, the thermoelectric generator, and devices making use of the principle of magnetohydrodynamics, are being carefully explored.

(Continued on next page)

GROSS REVENUE MILLIONS OF DOLLARS
OF THE POWER COMPANIES



YEARLY TOTAL OF TAXES IN MILLIONS OF DOLLARS
PAID BY INVESTOR-OWNED ELECTRIC UTILITIES



ELECTRIC UTILITY STATISTICS

INVESTOR-OWNED ELECTRIC COMPANIES	1960 Estimated	1959
Gross Revenues	\$11,500,000,000	\$10,800,000,000
Taxes	2,350,000,000	2,190,000,000
Total Electric Utility Plant (Dec. 31)	46,000,000,000	42,650,000,000
Construction Expenditures	3,350,000,000	3,383,000,000
TOTAL ELECTRIC POWER INDUSTRY		
Energy Generated by Fuel (million kwh) (Steam and Internal Combustion)	685,000	571,993
Energy Generated by Hydro (million kwh)	165,000	137,707
Total Generation (million kwh)	850,000	709,700
Energy Sold to Consumers (million kwh)	667,400	626,700
Generating Capability December 31 (mw)	175,900	163,300
Number of Residential Customers December 31	50,000,000	48,968,000
Average Residential Use per Year (kwh)	3,815	3,585
Average Cost per Kwh for Residential Use	2.47c	2.50c

TABLE I

The Electric Power Picture: United States vs. Russia

Criterion	U. S.	U. S. S. R.
Total Production in 1960	845-billion kwh	275-billion kwh
Generating Capability in 1960	193.9-billion kw	66.6-million kw
1965 Goal for Generating Capability	245-million kw	121-million kw
Power Use Per Capita in 1960	4716 kwh	1322 kwh
1965 Goal for Use Per Capita	6000 kwh	2200 kwh
Power Used for Industrial Purposes	48% of Total	80% Total

TABLE II

The Electric Industry's Sales Record

Customer Classification	1960 Sales (Billion Kwh)	Percent of Total	Billion Kwh Increase Over 1959
Large Industrial	323.5	48.5	14.7
Residential	188.9	28.3	15.5
Commercial	114.4	17.1	7.7
Other	40.6	6.1	2.8
Total	667.4	100.0	40.7

One of the chief problems that has faced the electric companies during 1960, and that will continue to face them during 1961, is the problem of rising costs. To combat these costs, electric companies work constantly to increase their efficiency—and the results have been good.

It took 10 pounds of coal to produce one kilowatt-hour of electricity in Edison's early generators. Today, modern power plants are able to produce a kilowatt-hour of electricity from three-quarters of a pound of coal. Technological improvements such as this, brought about through the efforts of the electric utility companies and the electrical equipment manufacturers, have made it possible for the electric companies to keep their investment per kilowatt down.

During 1960, the Consumers' Price Index reached a point more than double what it was 25 years ago. But the average price per kilowatt-hour of residential electricity in 1960 was only 2.47 cents—less than half of what it was 25 years ago.

Despite the many services it performs, and the steadily increasing quantities in which it is being used, electricity's place in the family budget is small. The latest available figures show that only 1.3 cents of each dollar spent by American families went for electricity. The ladies spent more than this for cosmetics.

Despite its small cost, the value that electric service provides is great. The record of growth of the nation's electric companies is ample evidence of this fact.

Electric service has done much for the American people in the past, but the electric companies believe even greater possibilities lie ahead. The future holds promise of electrical appliances, equipment and machines which will make the America of 1960 seem almost primitive.

As use of electricity increases, the electric companies will be ready, as they have been in the past, to supply the abundance of electric power the nation will need. Financed in the free market, the nation's investor-owned electric companies will be able to meet in full the power needs of all Americans.



POWER USE: UP 225 PERCENT IN NEXT 15 YEARS!

TOTAL ELECTRIC POWER use in the United States continues its upward trend. EL&P predicts that sales of electricity by all utilities—investor-owned and government-owned—to ultimate customers will hit close to 2200 billion kwh by 1975. This 225-percent rise over the next 15 years is predicted on the assumption that there will be no shooting war and that international political tensions will continue.

The following pages show and examine trends in residential, industrial, commercial, farm, street and highway lighting, and in regional growth. (The Regional Growth section is based on 1960 Census figures.) Growth contributions from all categories should push this year's total energy consumption up 12 percent from that of 1960.

Residential Use: Up 8.9 Percent

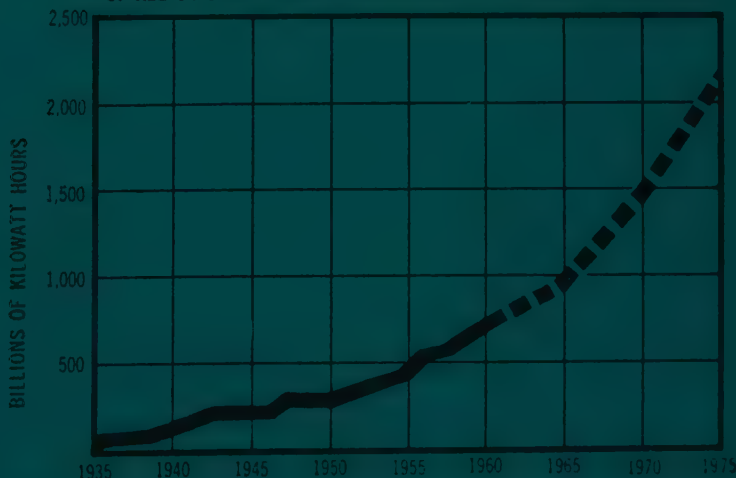
Preliminary figures for 1960 residential kwh sales show an 8.9 percent gain to 188.9 billion kwh. Sales for 1961 are expected to total 205.9 billion kwh, for a 9 percent gain. With respect to longer term projections, sales increases are expected at an average 9 percent per year during the 1960's with 1965 sales at 290 billion, and 1970 sales 447 billion kwh. By the three quarter century mark, residential sales should reach 888 billion kwh at the expected 9 percent rate of growth. Such a total

would exceed kwh sales to *all* customers in 1960 (667 billion).

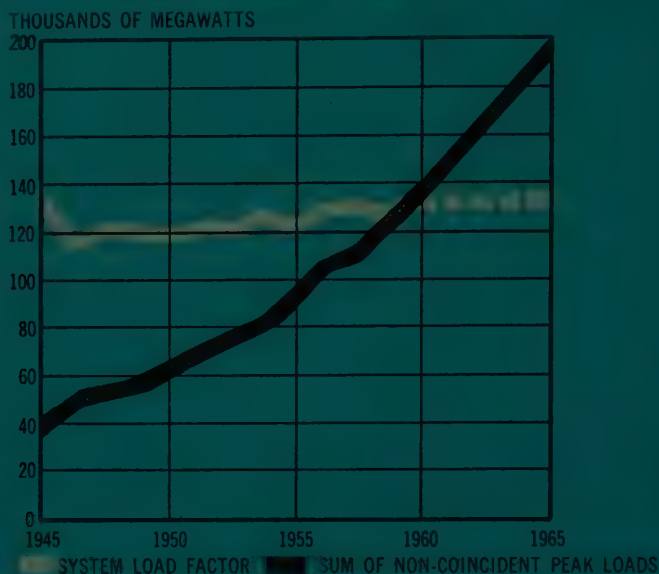
Residential customers exceeded 50 million at last year's end, which is a 2.1-percent increase over 1959. At year-end 1961, more than one million *new* residential customers should be added to utility lines. On a long-term basis, 1965 and 1970 should see 56 million and 62.2 million customers, respectively, and by 1975, residential customers should total 68.7 million. This approximates a 2.1 percent rate of growth per year.

Kwh per customer sales totaled about 3815 in 1960, or 230 kwh per customer increase over 1959. In the 1950-1960 decade, residential sales per customer average 7.7 percent increase per year and are predicted to grow at a 6.6 percent rate during the 1960's, totaling 4065 kwh in 1961, with 1965 sales at 5237 kwh. Sales per customer in 1970 are estimated to be 7262 kwh. By 1975, residential usage is expected to approximate the 10,000 kwh mark. In the last 25 years (1935-1960), resi-

**SALES OF ELECTRICITY
OF ALL UTILITIES PUBLIC AND PRIVATE TO ULTIMATE CONSUMERS**



DEMAND AND AVERAGE U.S. LOAD FACTOR



dential kwh use per customer has grown from 677 to 3815. During the 25-year span, there has been increased usage *every year* despite two wars and four recessions (1937-8, 1949, 1954, and 1958) which indicates the strength and growth characteristics of residential demand for electricity.

Power use in the residential category will pass a healthy milestone sometime before 1975, but by 1975, the average residential user will be buying well over \$200 worth of electricity per year! This projected figure is calculated in current dollars. The average annual residential bill in 1960 averaged close to \$95 and is expected to reach \$100 without any trouble sometime during this year.

Factors which will contribute to continued increased residential sales are higher family income, increasing household formations resulting from population expansion, and improvements and inventions in the electric appliance industries. In addition, year-round electric heating and cooling load will continue to contribute materially in increasing residential loads.

EL&P continues its two-years'-running prediction that there will be 1,800,000 completely electrically heated homes in 1965, compared with slightly more than 750,000 at

the end of last year. Recent predictions by EEI show that by 1970 there should be six million electrically heated homes.

Industrial Use: Up 4.8 Percent

Long-term trends indicate that utility sales to industrial customers should grow at an average rate of 8.1 percent per year in the next decade and a half. Industrial sales in 1965 should total 447 billion kwh, those in 1970, 704 billion kwh, and slightly more than one trillion kwh in 1975!

Preliminary data by EEI show that sales by utilities to industrial customers for the year 1960 totaled 323.5 billion kwh, an increase of 15 billion kwh, or 4.8 percent over 1959. The expected increase of industrial activity in 1961, especially in the last half, should result in new record sales of about 350 billion kwh, an increase of 8.1 percent.

Industrial kwh used per worker continue to reflect increasing use of electric automation in industry. Use of electricity in manufacturing per production worker was slightly in excess of 30,000 kwh in 1960. Projected at the 7.2 percent rate of growth experienced in the 1950-60 decade, our manufacturing industry would be using about 90,000 kwh for each industrial worker by 1975.

The 7.2 percent annual compound rate of growth is the equivalent of doubling every ten years.

This data includes all power use including electricity used in the reduction of aluminum and magnesium, and Atomic Energy use. These particular uses have higher per-worker consumptions.

Purchase of electric power by the Atomic Energy Commission has grown from 2.3 billion in 1950 to about 55 billion at present. Such use is classified as industrial (large light and power) sales and during the 1950 decade has had great bearing on the growth rate reported for industrial sales.

Recent leveling off of use by AEC (since 1955) gives reason to believe that kwh sales to the AEC will remain at the present level of about 55 billion over the foreseeable future.

If, therefore, the growth of power sales to AEC as experienced in the 1950's were deleted from industrial sales, a lower rate of use of electricity per production worker in manufacturing should be projected. Such projection would be at about 5½ to 6 percent rate of growth (rather than 7.2 percent), and would be the equivalent to about 70,000 kwh per production worker in manufacturing by 1975, rather than the 90,000 kwh projected. AEC use would be assumed to grow as was the experience in the 1950 decade.

The KWH— Worth Many Men's Work

Edison Electric Institute emphasizes how much power is used by the United States worker: EEI calculates that the daily use in 1959 by the average production worker in manufacturing was the equivalent of 429 extra men! In other words to do the same job without the power, add 429 men per man to the payroll!

Commercial Use: Up 7.2 Percent

This decade should experience continued good increases in commercial kwh sales. During the 1950's, sales increased by an average of 9.2 percent per year a

customer increases averaged 1.5 percent per year. In the early postwar years from 1945-1950, sales had averaged a 10.6 percent increase per year; however, a 4.4 percent per year increase in commercial customers contributed substantially to the commercial kwh sales increases during this period.

Preliminary figures for 1960 show 14.4 billion kwh were sold to commercial customers—a gain of 7.2 percent over the 106.7 billion in 1959. Sales this year should total 123.9 billion kwh, a gain of 8.3 percent. Over a longer term, sales are expected to increase at an 8.3 percent annual rate to 171.1 billion in 1965, 255 billion in 1970 and 382 billion in 1975.

Use per commercial customers grew more rapidly (7.4 percent) in the 1950's than 1945-50 period of immediate postwar growth (5.6 percent). Commercial kwh use per customer, currently at about the 17,900 level, should reach 24,660 kwh by 1965 and 34,100 kwh by 1970, and should exceed 47,000 kwh by 1975 if projected at the 6.7 percent rate of growth expected during the 1960's.

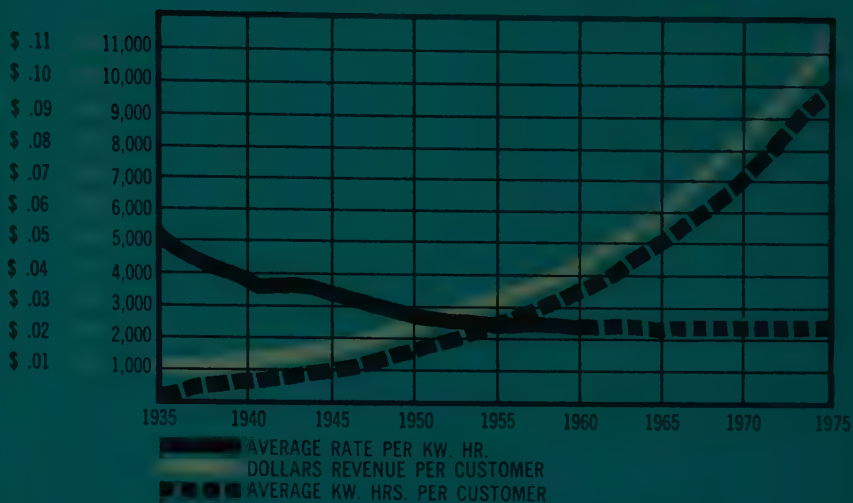
Customer growth in the commercial category is projected at a 1.6 percent rate of growth during the 1960's and at 1.5 percent from 1970 to 1975. All commercial sales and customer data were revised in 1960 (with 1959 adjusted accordingly) because of reclassification of Consolidated Edison's commercial and industrial customers by EEI. Thus Con Ed's customers would be classified more in line with the electric utility industry's classification.

Factors supporting continued commercial growth include (1) further development of new shopping areas, (2) greater modernization of lighting and continued installation of air conditioning in existing facilities, (3) school modernization and expansion and (4) new construction of modern office buildings having the latest lighting and air conditioning facilities.

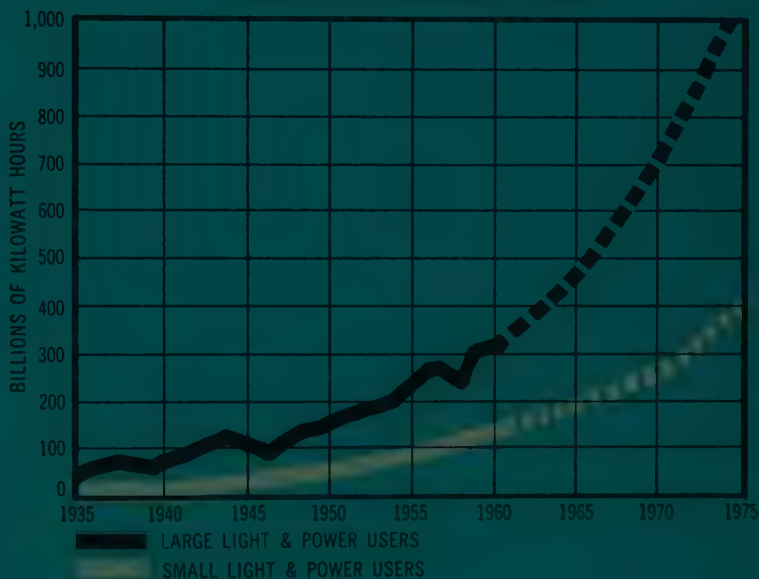
Street and Highway Lighting Growth: Stable

During the 1950 decade, kwh sales to street and highway lighting customers have exhibited a stable growth trend, averaging almost 8 percent annually.

RESIDENTIAL ELECTRIC SALES NATIONAL AVERAGE



INDUSTRIAL AND COMMERCIAL GROWTH



THE KWH—AN INDUSTRIAL BARGAIN



Street and highway lighting sales are expected to total 6340 million kwh in 1960, 9510 million kwh in 1965, 14,100 million kwh in 1970, and 20,800 million kwh in 1975.

Farm Use: Maybe Soon a Surge

During the 1950's, power use per farm in the United States has grown at a slightly faster rate than either residential or commercial use per customer. However, many agricultural authorities consider that farm power use is only now on the brink of its greatest increase. A summarization of the reasoning for this feeling seems to be that the modern farm home has an equal or better opportunity for the load growth experienced in the residential class, and that the many items of large use equipment that are achieving wide acceptance will multiply the use of electricity on the farmstead.

Research into more efficient farm operation continues. An increased use of electricity on the farm will be a natural off-shoot. Many of the efficiency-increasing items will need more and more power. This trend was substantiated at the winter meeting of the American Society of Agricultural Engineers in Memphis, Tenn., last December. Some of the ideas discussed at this meeting follow.

Environmental control of animals continues as a trend. In poultry houses, several power-consuming methods of lowering ambient temperatures are being tried. These methods include pad and fan, fogging and air conditioning (by heat pump or window type unit). Experiments have shown that optimum brooding temperatures are more readily obtained in the mechanically ventilated or air conditioned poultry houses. Supplemental lighting in hen houses has continued to show benefits.

Crop drying and aeration continue to present a load building opportunity, as do mechanized barn cleaners, motorized feed lot conveyors, remote-control chicken house scrapers, automatic egg markers and sorters and many, many more.

Automation on the farm is expected to continue and increase. Present trends show that farm population in 1975 will be some six mil-

lion less than what it is now, with a million less farmers to supply the estimated 210 million people in the United States at that time. The Stanford Research Institute Journal, 3rd Quarter, 1960, stated that the average commercial farm of 1960 reaped some \$14,000 worth of produce. By the year 2000, SRI expects that this figure will have risen to about \$100,000 per year per farm, with no increase in the number of farm laborers. Thus, farm labor productivity must increase by 500 percent or more.

The trend toward farm automation is so pronounced, that even the digital computer is being used to optimize materials handling systems by linear programming!

EEI statistics concerning the farm load are divided into two classifications, namely, those farms east of the 100th Meridian where little or no irrigation is involved and western farms where irrigation use fluctuates greatly with weather conditions; hence, no future use projections have been attempted for this classification.

For farms with little or no irrigation, 1959 annual use per customer was 4875 kwh for a 10.1 percent increase. Use by 1965 should reach at least 7400 kwh per farm, and if projected at growth during the 1950's should approximate 10,600 kwh in 1970, and about 15,000 kwh in 1975.

For farms where irrigation may be involved annual kwh per customer in 1959 was 9292.

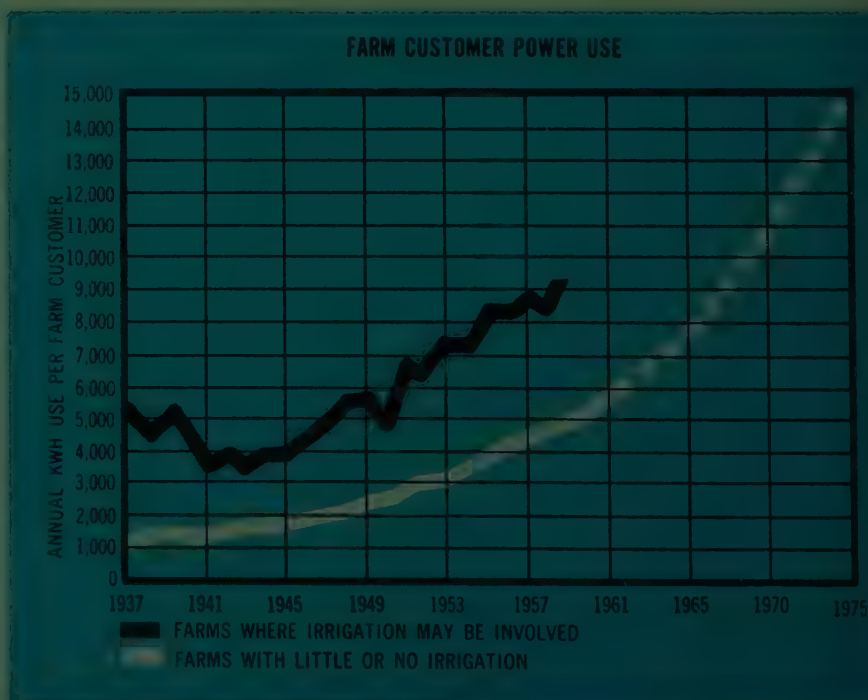
Kwh Follow Population

The population of the United States increased a record 28 million in the 1950 decade, surpassing the former record increase of the 1940's by 8.8 million.

The most rapidly growing areas were the Pacific and Mountain divisions, which showed 40 percent and 35 percent population increase respectively, compared with an 18 1/2 percent national increase. The Pacific division led in absolute gain with 6.1 million, followed by the East North Central States with 5.4 million.

The East South Central Division while ranking last among the nine divisions in population growth with a 5 percent increase, experienced the most rapid kwh sales growth of any region in the last ten years. The East South Central's 320 percent increase in total kwh sales compares with the 152 percent increase for the total United States in the 1950 decade.

The East South Central States include Kentucky, Tennessee, Alabama and Mississippi. The phenomenal total kwh sales increase in these states result from a 273 percent increase in residential sales.



THE 50's—A DECADE OF GROWTH

ATION.....9.5%
ELEC. CUSTOMERS. 26%
KWH SALES.....134%
NTIAL KWH SALES.183%
TRIAL KWH SALES..117%

ATION.....40.2%
ELEC. CUSTOMERS. 49%
KWH SALES.....127%
NTIAL KWH SALES.193%
TRIAL KWH SALES..107%

ATION.....35.1%
ELEC. CUSTOMERS. 51%
KWH SALES.....190%
NTIAL KWH SALES.205%
TRIAL KWH SALES..214%

ATION.....16.6%
ELEC. CUSTOMERS. 49%
KWH SALES.....224%
NTIAL KWH SALES.311%
TRIAL KWH SALES..212%



POPULATION.....19.2%
TOTAL ELEC. CUSTOMERS. 27%
TOTAL KWH SALES.....148%
RESIDENTIAL KWH.....169%
INDUSTRIAL KWH SALES..157%

POPULATION.....12.8%
TOTAL ELEC. CUSTOMERS. 19%
TOTAL KWH SALES.....102%
RESIDENTIAL KWH SALES.151%
INDUSTRIAL KWH SALES..76%

POPULATION.....13.3%
TOTAL ELEC. CUSTOMERS. 20%
TOTAL KWH SALES.....89%
RESIDENTIAL KWH SALES.157%
INDUSTRIAL KWH SALES..70%

POPULATION.....22.6%
TOTAL ELEC. CUSTOMERS. 53%
TOTAL KWH SALES.....172%
RESIDENTIAL KWH SALES.262%
INDUSTRIAL KWH SALES..129%

POPULATION.....5%
TOTAL ELEC. CUSTOMERS. 44%
TOTAL KWH SALES.....320%
RESIDENTIAL KWH SALES.273%
INDUSTRIAL KWH SALES..379%

TOTAL U.S. GROWTH
POPULATION.....18.5%
TOTAL ELEC. CUSTOMERS. 34%
TOTAL KWH SALES.....152%
RESIDENTIAL KWH SALES.198%
INDUSTRIAL KWH SALES..151%

and a 375 percent increase in industrial sales compared with 198 percent and 151 percent respectively, for the entire country. Investor-owned electric utilities in 1959 sold only about 28 percent of the total kwh sales reported in the South central division, according to EEI's statistics. Contributing substantially to the growth of industrial sales reported for Kentucky and Tennessee is electricity consumption by the Atomic Energy Commission purchased from TVA, which approximates 30 billion kwh or 60 percent of industrial sales reported for those two states in 1959. In 1950, such sales were less than 2 billion kwh.

Except for the disparity of the east South Central States, the population shift westward and southward (South Atlantic States) was correlated with above average growth of electric customers and electricity use.

Advance reports of the 1960 Census of Population show that from April 1950 to April 1960, the following five states have achieved the

largest population rates of growth:

State	Population % Increase
Florida	79
Nevada	76
Arizona	74
California	49
Delaware	40

The following data, showing the five states with the greatest increases in total electric customers during the decade of the 1950's, indicate that the increase in electric customers is similar to the population shift westward and southward:

State	Total Electric Customer % Increase
Florida	113
Nevada	94
Arizona	87
New Mexico	72
Louisiana	56

However, in absolute numbers, utility systems in California added the most customers of any state in the 1950's—1,915,000. Texas ranked second with 1,079,000 new customers while Florida added 884,000.

States with the largest percentage increase in total kwh sales during

the 1950 decade were:

Kentucky	761
Wyoming	403
Texas	320
Florida	320
New Mexico.....	306

Ohio led all states with a gain of 38.8 billion kwh, or 232 percent, due largely to a good 304 percent increase in sales to industrial customers. California ranked second in total kwh sales gain with an increase of 28.4 billion, or 133 percent; and Kentucky's gigantic 761 percent increase resulted from the third largest absolute kwh sales gain of 24.1 billion.

The 1960 decade should show further expansion of the electric utility industry with the greatest percentage growth occurring in the south and west regions of the United States, where the population trend is expected. Large actual gains are expected to continue in the heavily populated and industrialized northeast and north central regions, where electricity is such a vital product of all classes of customers.



MANUFACTURERS APPROACH 1961 WITH WARY EYE

Profit-squeeze, foreign competition, still keep equipment manufacturers guessing. Overall economy to improve.

WITH a disappointing 1960 behind them, the nation's manufacturers are turning their eyes toward 1961 with hope. But they are looking toward 1961 without the enthusiastic confidence so prevalent a year ago.

What will happen in the year ahead is all the more clouded in the light of the elusive business upturn which was to have occurred in 1960, but failed to materialize. A year ago, almost all economic forecasters were bubbling over with gloriously shining predictions for 1960 as the beginning of the Sizzling Sixties. In retrospect, one of the nation's largest securities firms summed the failure of the economy to develop according to expectations as the Year of the Fizzle of the Sizzle.

In the early spring of 1960, Secretary of Commerce Mueller stated in a meeting in Washington, that 1960 would be a good year, not a record year. And so it was. Gross national product was up between 4 and 5 percent; national income was up 5½ percent, to \$420-billion; wages and salaries were up to \$285-billion, an increase of 6 percent. Corporate profits were down, however, by \$1-billion before taxes and \$800-million after taxes.

This so-called flop of the economy has thus cast a cloud of feeling somewhat akin to pessimism over the economic horizon. With no out-

side stimuli to the market in sight, there seems to be little hope that the first six months of the year will produce any earthshaking reverse of the trend apparent in the last six months of 1960. However, all indications are that there will be a movement later in the year which will probably exceed the low of 1960 during the last quarter.

The brightest spot in the economy may well be the construction industry, where a total gain of 3.5-percent over 1960 is expected to produce a rise in 1961 to an all-time peak of \$76.8-billion. A large part of this total will be in the area of heavy construction, where a resumption of the highway program and continued utility construction are expected to push this segment of the construction industry up to about \$14-billion.

On the basis of reports from organizations representing over 81-percent of the generating capacity of the United States, as surveyed by ELECTRIC LIGHT AND POWER, utility construction funds earmarked for use in 1961 are up 8.9 percent over 1960, to a whopping big \$4.6-billion. Complete details of this increase in construction will be found in Part 4 of this report.

1960 Had Bright Spots

Surprisingly, electrical manufacturers in the United States took the

talk of recession in stride and ended up the year with factory shipment of an estimated \$22.6-billion, an all time high, and 5 percent better than in 1959. This figure includes all electrical products, whether or not they are within NEMA's scope, and cover shipments by non-member as well as members.

By completely straddling the fence, NEMA approaches 1961 with a prediction which seems to typify the majority of forecasters. They state that business, in general, "could rise slightly to \$22,795,500,000, remain at 1960 levels or drift downward by as much as 5 percent." According to Joseph F. Miller, managing director of NEMA, "Much depends on an anticipated gain in the economy during the latter half of 1961, since most electrical manufacturers forecast a slow first half."

Last year, generation, transmission and distribution equipment shipments jumped up 3-percent to \$2.18-billion from 1959's total of \$2.116-billion. The NEMA forecast is for a decrease in shipments of generation, transmission, and distribution equipment in 1961 to \$2.0 billion, down 3.5-percent from last year. However, this does not necessarily reflect the true sales picture since some equipment shipped in 1961 will reflect the decrease in utility construction and buying last year.

Order Backlog Still Low

The 28th Semi-Annual Electrical Power Survey issued by EEI last year revealed that the order backlog for steam turbine-generator manufacture continues to decrease with the total reported in the survey being the lowest recorded at the end of any quarter during the past ten years, with the single exception of the backlog held at the end of the third quarter of 1954.

The capacity total of hydraulic turbines scheduled for shipment in 1961 is expected to equal the total shipped in 1958 or about 85-percent of the record-high production of over 4-million hp in 1959.

At present, with approximately 80-million kva of manufacturing capacity available for production of transformers of 501 kva and larger, almost 30-percent of productive capacity is currently scheduled.

For the electrical equipment manufacturing industry as a whole, production has been running at slightly less than 75-percent of capacity, although by the end of 1960 it was hoped that this could be raised to 79 percent. With a preferred rate of 93-percent, this means that there is still a great deal of capacity open.

This problem has been complicated in recent years by the continuous expansion programs carried out by most manufacturers in the industry. McGraw-Hill, in their survey of Business Plans for New Plant and Equipment, disclosed that again in 1961 manufacturers will increase their expenditures for new plant and equipment. They forecast a 10-percent increase this year, part of which has been attributed to plans deferred from 1960 to the new year.

Profit Squeeze Continues

Two factors which may effect the utility industry in the long term may start to influence manufacturers this year. The electrical manufacturing industry in 1960 spent as much money for research and development as all the rest of American industry put together (excluding government spending). With reduced profits and the possibility of lower billings again in 1961, some of these R and D projects may have to be postponed, at least temporarily. This situation may further be complicated if foreign competition should increase, forcing further reductions in the prices of American-made equipment, and further reductions in profits.

Manufacturers have been somewhat reluctant to voice their opinions as to what the year ahead will mean to their company. Undoubtedly, many manufacturers are still very much in the dark and are actually in no position at this time to make any accurate forecast. The situation is further complicated by the fact that some utilities are buying equipment during pricing soft spots, instead of waiting and ordering with normal lead time. In some cases orders are currently placed at today's prices for delivery two and three years hence.

GE's Ralph Cordiner stated in his end-of-the-year report that price reductions due to competition in-

duced by ample capacity, as well as competition by offshore manufacturers, appear to have run their course. "We anticipate a levelling off or gradually higher prices for the electrical manufacturing industry generally," he said.

"Just when in 1961 the uptrending sectors (of the economy) will begin to outweigh the downtrending sectors, and produce the next period of expansion, is anybody's guess. The course of the economy will be determined not by the records of the statisticians, but by the quality of business leadership in meeting the realities of the marketplace," he declared.

One of the smaller manufacturers has said his company anticipates a sales increase of about 7-percent in 1961. However, the company recently completed a new manufacturing facility, so that the increase will still not enable the company to approach total productive capacity, although it will maintain their planned rate of growth.

Westinghouse billings in 1961 are expected to show an increase for the fourth successive year, according to Mark W. Cresap, Jr., president. With the backlog of new orders holding steady, 1961 sales should show some improvement over the 1960 total of slightly more than \$1,910,000,000, but not quite up to the record \$2,009,000,000 in sales of 1957. The decline in prices coupled with an increase in labor and material costs intensified the pressure on earnings last year and the adverse effect is not expected to show any great improvement until the third quarter of 1961.

However, capital expenditures are expected to increase for the third consecutive year, to between \$60- and \$65-million, with heavy emphasis on plant improvement programs and other cost reduction measures.

"Shipments of generating apparatus often indicate the volume of all types of capital equipment being delivered to customers. In this respect, generating apparatus shipments next year should be up slightly over 1960," Mr. Cresap pointed out in his year-end report.

The trend toward fewer, but larger units, with greater efficiencies is expected to continue. Thus, competition per unit is increased.

The aluminum industry seems optimistic about the year ahead, encouraged in part by the utility industry's EHV uses of aluminum for cable, towers and substations. Another promising prospect: transformer manufacturers' use of aluminum strip conductor in coil windings. If acceptance for this innovation can be gained generally, it would open up a new 12,500-ton market.

Cornell C. Maier, general sales manager, electrical conductor division of Kaiser Aluminum, and Chemical Sales, Inc., has forecast a 10-percent increase in sales of overhead conductor this year, primarily due to the several EHV projects planned by utilities. "For the first time," he said, "a really significant percentage of our transmission cable sales will include extra-high-voltage conductors. Another relatively new development which will continue to influence our sales and research efforts is the growing popularity of residential underground distribution systems."

Effect of Anti-Trust Action

Undoubtedly, another factor which may effect manufacturers in 1961 will be the reactions of utility buyers to the guilty pleas entered by 19 of the largest manufacturers in the government price fixing and bid rigging trial recently in Philadelphia.

At least one manufacturer has evidenced an opinion that, due to recent drastic price cuts, utility buyers now feel that they have paid inflated prices in the past. How this feeling, if at all industry wide, will effect sales this year, remains to be seen.

To sum up, manufacturers look to a somewhat improved year, in 1961, but not until the third quarter is business expected to pick up appreciably. There is plenty of productive capacity available, but the profit-squeeze may reduce this and research and development, unless cost saving techniques can be employed. However, prices will probably even out a bit, and may go up slightly.

All in all, it should turn out to be a relatively good year, but without producing any outstanding records.



ELECTRIC-UTILITY CONSTRUCTION HITS \$4.6-BILLION FOR 1961—UP 8.9%

Budgeted expenditures for power-system expansion in 1961 total \$4.6-billion. Generation budget is up 7.95 percent over 1960 expenditures; transmission up 23.36 percent; distribution up 3.07 percent; and general plant up 15.48 percent.

Advance reports direct to EL&P from our electric utilities disclose that they have budgeted a substantial over-all increase in new construction for 1961. It all adds up to an 8.9 percent increase over the new-construction expenditures reported for 1960.

This composite picture of what lies ahead comes from utilities possessing over 81 percent of the total generating capability of the industry.

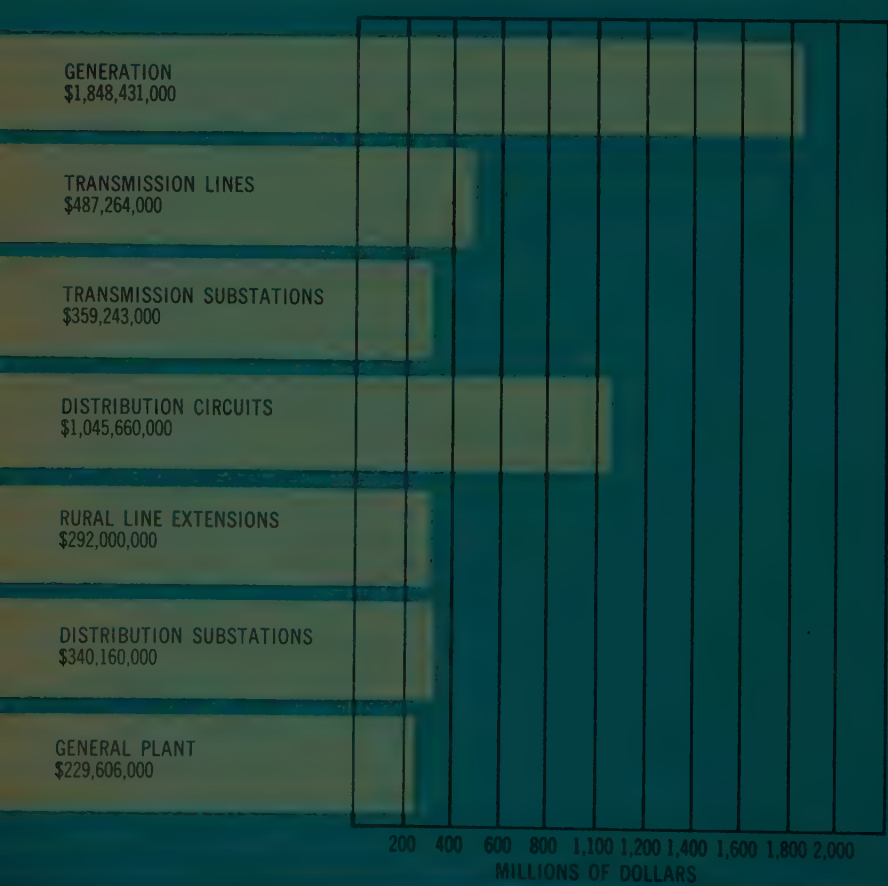
The accompanying chart shows the over-all 1961 budget allocation to major categories of new facilities. For comparison, here are the corresponding figures reported as actual expenditures in 1960:

Category	Spent in 1960
Generation	\$1,712,329,000
Transmission	
Lines	403,200,000
Transmission	
Substations	282,988,000
Distribution	
Circuits	1,021,203,000
Rural Line	
Extensions	279,996,000
Distribution	
Substations	326,589,000
General Plant	198,830,000

Reference to EL&P's forecast of 1960 expenditures, which was published in our Jan. 15, 1960, issue, will show that generation expenditures held extremely close to the predicted figure: \$1,716,000,000 predicted—\$1,712,329,000 reported actually spent. Distribution-circuit expenditures exceeded EL&P's estimate \$1,021,203,000 vs. \$968,000,000. Expenditures for transmission lines were cut back from \$440,000,000 to \$403,200,000; transmission substations from \$352,000,000 to \$282,988,000; rural line extensions from \$308,000,000 to \$279,996,000; distribution substations from \$396,000,000 to \$326,589,000; and general plant from \$220,000,000 to \$198,830,000.

For the information and guidance

1961 CONSTRUCTION BUDGET ALLOCATIONS
(BASED ON EL&P SURVEY ANALYSIS)



the electrical manufacturers, detailed tabulations are included in this report which show the approximate breakdown of anticipated 1961 expenditures for new equipment and facilities in all categories of new construction.

Same Factors Delay Program

As was reported a year ago, difficulties encountered in acquiring rights-of-way for transmission lines and sites for substation continue to be the utilities' most severe handicaps in carrying out system-expansion plans.

Further severe handicaps include failure of suppliers to meet equipment delivery promises, and shortage of design engineers and draftsmen.

One utility executive commented that his utility has found it necessary to use outside firms to assist with engineering design due to the shortage of trained personnel within the company.

Here are some of the more pertinent supplementary comments often regarding the factors which most aggravate delays in construction programs:

"Interposing highway or other public work into construction schedule, thereby delaying planned construction."

Most of our delays are caused by the shifting of target dates by customers or public authorities. For example, the target dates on development of new subdivisions are often changed on short notice. Construction of new facilities for industry is often delayed because of customer's delay in completion of service contracts or in giving notice of change in service requirements. Delays are normal when it comes to locating facilities for highway, sewer or other governmental projects. Often very little information can be obtained as to the target

TABLE I

POWER GENERATION CONSTRUCTION	
1961 Estimated Expenditures (Based on EL&P Survey Analysis)	
A—Structures	Amount
Ground Improvements	\$ 16,077,000
Main Building Substructures	48,048,000
Main Building Superstructures	74,105,000
Main Building Steel	64,680,000
Lighting	9,055,000
Miscellaneous Structures	4,805,000
Total Structures	\$ 216,770,000
B—Boiler Plant	
Steam Boilers and Accessories	\$ 366,274,000
Draft Systems	41,026,000
Feedwater Systems	71,333,000
Instruments and Meters	12,751,000
Boiler Plant Piping	130,838,000
Fuel and Ash Handling	40,656,000
Miscellaneous Steel and Iron	13,490,000
Total Boiler Plant	\$ 676,368,000
C—Turbine Plant	
Turbine-Generators and Accessories	\$ 444,629,000
Condensing and Cooling Equipment	71,702,000
Circulating Water System	63,017,000
Instruments and Meters	4,620,000
Total Turbine Plant	\$ 583,968,000
D—Electrical Plant (Excluding Switchyard)	
Main Power Equipment	\$ 39,732,000
Auxiliary Power Equipment	75,214,000
Misc. Equipment and Communication	1,109,000
Temporary Power and Light	5,174,000
Total Electrical Plant	\$ 121,229,000
E—Miscellaneous Equipment (Cranes, Hoists, Air Compressors, Machine Shops, Fire Protection, Locker Rooms, etc.)	\$ 17,187,000
F—Spare Parts	\$ 7,392,000
G—Top Charges (Professional Services, Field Supervision, Temporary Construction Facilities, Miscellaneous Construction Expense)	\$ 225,086,000
TOTAL GENERATION CONSTRUCTION	\$1,848,000,000

TABLE II

TRANSMISSION SYSTEM CONSTRUCTION

1961 Estimated Expenditures (Based on EL&P Survey Analysis)

	Amount
Power Transformers	\$ 67,760,000
Circuit Breakers	50,820,000
Switch Equipment (Including Disconnect and Air Breaker Switches)	16,940,000
Insulators	29,645,000
Connectors, Clamps, Splices, Armor Rods	12,705,000
Wire (Including Aerial Cable)	143,990,000
Cable (Including Potheads and Underground Cable)	16,940,000
Pole Structures (Including Hardware)	67,760,000
Tower Structures	25,410,000
Engineering	42,350,000
Other (Including Substation Structures)	8,470,000
Total Equipment	\$ 482,790,000
Labor	364,210,000
TOTAL TRANSMISSION CONSTRUCTION	\$ 847,000,000

TABLE III

DISTRIBUTION SYSTEM CONSTRUCTION

1961 Estimated Expenditures (Based on EL&P Survey Analysis)

	Amount
Poles	\$ 83,891,000
Crossarms	23,489,000
Hardware (Includes hardware for guys)	57,046,000
Steel Strand (Includes guys)	5,033,000
Overhead Conductors	152,682,000
Connectors (As applied to conductors)	8,389,000
Cable	60,402,000
Insulators and Insulator Hardware	13,423,000
Switches, Cutouts, Fuses and Arresters	50,335,000

TABLE III continued on page opposite

date until the contractor starts to move in on the job."

"Building permits—variance in building ordinance usually required."

"Program Speeded Or Slowed?"

A number of utility executives commented as to the reasons for a change of pace in their new-construction program during 1960. Here are the more significant observations:

"Slowed down about 15% from that budgeted a year ago. Load growth less than forecast a year ago because of poorer economic climate."

"Slow down—building too much reserve into system too rapidly."

"No change excepting that entire physical plant is getting into better shape to take care of existing and forecast loads."

Only about eight percent of the utilities reported that increasing cost and difficulty of raising new capital is handicapping expansion plans. One respondent commented "We are seeking increased revenues to increase rate of return." Another observed that "Increasing cost of capital is always a problem but to date has not prevented new construction when and where essential."

As to specific action which should be taken by the industry to alleviate the situation, one respondent advocated "greater depreciation allowance under F. I. T." while another limited himself to the comment "fair value."

Lower Increase In Peak

During 1960, the over-all average peak demand of the respondent utilities was 107.2 percent of the 1959 composite peak demand. Last year the figure for 1959 over 1958 was 109.8 percent.

For the respondent utilities, 40 percent experienced their 1960 all time peak within the July-August-September period; 50 percent in December.

Summary Comments

It appears from the information reported herein that 1961 is destined to be a busy and challenging year for the electric utilities, and for the electrical manufacturing companies which serve this industry.

Increased load is the prime requisite for all concerned. Cumulative effects of the industry's concerted promotional effort should provide a great stimulus.

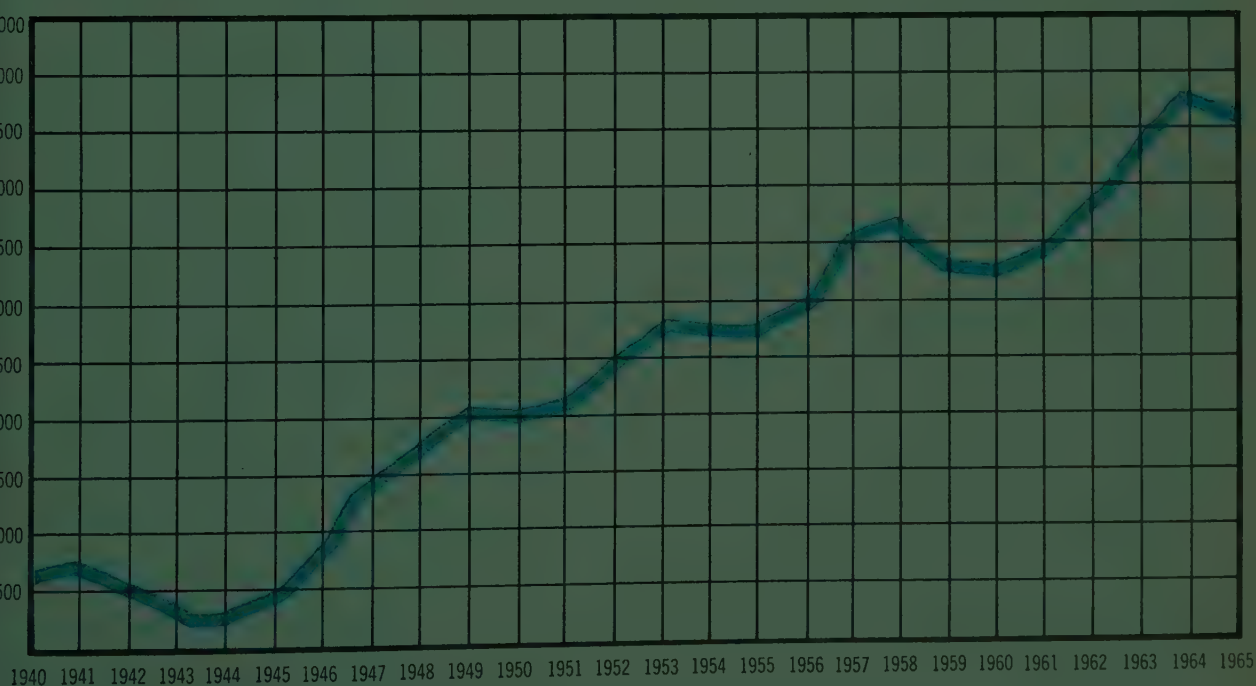
note of thanks—

Once again; profound thanks are due the busy utility executive staffs throughout the country who have provided the information that makes possible this annual report on the industry's construction program for the new year.

TABLE III (Continued)

Circuit Breakers	52,012,000
Regulators	18,456,000
Capacitors	20,134,000
Transformers	
Power Ratings (Above 500 kva)	75,502,000
Distribution Ratings (500 kva and below)	265,096,000
Meters and Metering Equipment	110,736,000
Street Light Fixtures and Supports (Includes only street lighting facilities owned and operated by electric utilities)	10,067,000
Misc. Station Electrical Equipment, Buses and Grounds	25,167,000
Underground Ducts and Manholes (Installed)	55,368,000
Structures (Installed)	36,912,000
Installation Labor, Equipment and Overhead Costs (Not included in "Underground ducts and manholes" and "Structures")	553,680,000
TOTAL DISTRIBUTION CONSTRUCTION	\$1,677,820,000

CONSTRUCTION EXPENDITURES
INVESTOR-OWNED COMPANIES





UTILITIES' YEAR-END STATEMENTS SPELL OUT BIG CONSTRUCTION PLANS

Some of the best proof that 1961 can be a "good" year is found in the electric utility industry's construction budgeting, computed and recorded elsewhere in these EL&P survey findings, though these figures are not presented in any geographical breakdown, nor are statistics identified with individual companies. The year-end statements of the companies tell an even more significant story about such area-by-area optimism for doing business the coming year.

Company by company, across the whole United States, the betting on the future is as strong as ever. These commitments support with telling emphasis the utility management view typified by EET's Pres. Sherman Knapp: "I'm confident that the slowing trend of 1960 will reverse itself completely with a quick recovery for the nation's economy in '61. I personally believe the 'peddlers of economic woe' who haunt American business with the prediction that 1961 will be a 'bad' year are wrong again . . ."

Here, section by section over the nation, are brief summaries of the construction plans announced by electric utilities at the outset of the new year:

The EAST Builds Big

NEW ENGLAND ELECT. SYSTEM, encouraged by prospects for new highs in both electric and gas sales

as well as in earnings, expects to spend about \$12-million for new construction in 1961. This augments a \$30-million program undertaken through 1960. Major construction jobs include the new Brayton Point tidewater steam electric station at Somerset, Mass. (initial capacity of over 500,000-kw) and the 230,000-volt transmission line to connect a sub-station at Sterling, Mass. with the Niagara Mohawk system, beginning in 1962.

CONSOLIDATED EDISON CO. of N. Y. has shaped a budget that adds up to a whopping \$1-billion for new plant and equipment over the next five years. Most prominent addition to ConEd's generating facilities in 1961: The Indian Point nuclear station.

PHILADELPHIA ELECT. CO. plans expenditures of \$73-million in '61, off a bit from the \$78-million of '60. During the five-year period, 1961-65, construction outlays are expected to be in the neighborhood of \$450-million.

BALTIMORE GAS & ELECT. CO. expects to devote \$36-million of a total \$45-million budget to electric construction in 1961. Included in this total is a figure of \$19-million for new generating capacity and associated transmission facilities, with the remainder to be spent largely on expansion and improvements to

the company's transmission and distribution systems. The first 191,000 kw steam-electric unit of the new Chas. P. Crane station is scheduled for commercial operation by early summer, when the company's generating capacity will reach almost 1.5-million kw. Baltimore G. & E. construction outlays over the next five years will exceed \$250-million (including about 80-percent for development of the electric system), giving the company a total utility plant investment of more than three-quarters of a billion dollars by the end of this period.

ATLANTIC CITY ELECT. CO. is scheduling a 1961 construction program costing \$22,770,000, part of a five-year program that totals \$116-million for the construction budget. By the end of 1965 the company will have well over a quarter billion dollars invested in facilities to serve Southern New Jersey.

POTOMAC ELECTRIC POWER CO. will spend \$55-million in '61, with plans for allocation of \$40-million each in 1962 and 1963. With the \$37 million spent in 1960, this will put PEPCO over the \$300-million mark for new construction in the last 10 years.

SOUTH: Budgets Bigger

FLORIDA POWER CO. is shaping its new 1961 construction budget that will approximate \$40-million. This compares with the 1960 construction budget of about \$32.5-million.

CAROLINA P. & L. is budgeting for \$37-million expansion in '61, vs the \$26-million expenditure in '60.

DUKE POWER COMPANY will spend over \$70-million in expansion in the new year as opposed to the \$66 million worth of planning in 1960.

MID-WEST: Stable, Growing

AMERICAN ELECT. POWER SYSTEM is working from a total budget of \$116,118,000 for '61, including \$59.1 million for generation, \$16.6-million for transmission and \$34.6-million for distribution. Of this, Appalachian Power Co. is to spend \$61.6

tion, Ohio Power Co. \$25.1-million, Kentucky Power Co. \$8.5-million, Wheeling Elect. Co. \$1.6-million and Kingsport Utilities, Inc. \$3-million. A large share of the budget category calling for the biggest increase—nearly \$20-million for hydro electric facilities—will go to the Smith Mountain pumped storage project. Close to \$53-million has been allocated for extension or improvement of American Electric Power System's transmission and distribution lines. The 1961 program compares with 1960 expenditures of \$112-million, and this year's outlay will bring to more than \$1.5-billion the capital expenditures of AEP's six operating utilities since the end of World War II.

DAYTON POWER & LIGHT CO.'s \$15-million construction program for '61 includes as the largest single item more than \$5-million for electric distribution. In 1960, when the company budgeted \$17.3-million for construction, this utility's total investment passed the \$300-million mark.

NORTHERN STATES POWER CO. will spend an estimated \$48-million for new construction in 1961 (including \$5-million for extending its natural gas service). Also included in the '61 outlay is a \$7-million expenditure for Northern States' atom-plant being built near Sioux Falls, S. D. and expected to be in operation in '62.

WISCONSIN POWER & LIGHT CO. is operating from a 1961 construction budget total of \$15,772,000 for electric facilities, part of an overall total (including gas and water) of \$19,891,000. In the spending for new electric facilities is \$7-million for a second unit of the Wisconsin utility's Nelson Dewey generating station.

CONSUMERS POWER COMPANY in '61 will spend over \$98-million—a decrease from the 1960 budget of \$106-million.

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY will make construction expenditures of \$38-million in '61, an increase from the 1960 budget which called for \$23-million.

The increase is due chiefly to the purchase and installation of the Lake Shore Plant (a fourth 250,000-kilowatt generating unit) which is scheduled for service in 1962. Total construction expenditures for the next five years are estimated to \$180-million.

UNION ELECTRIC COMPANY plans a construction budget of \$60-million for '61, with \$22-million going to transmission and distribution; \$6-million to complete the Meramec Unit 4; \$16-million to the Taum Sauk plant; \$3-million to the Missouri Power & Light Co., and \$1-million to Missouri Edison.

TOLEDO EDISON CO. plans new construction for which some \$9.3-million has been allocated in the 1961 budget—an amount nearly \$3-million greater than was spent in 1960. Largest single item in this utility's construction program is \$2.5-million for continuing construction on a third generating unit for the company's Bay Shore Station. The 1961 construction program will bring Edison's expansion total to \$133-million in the past 10 years.

WEST: All-time Highs

P. S. CO. OF COLORADO and its subsidiaries have drawn up a construction budget of \$55,449,000 for 1961—an all-time high for the company. Of this total, electric operations will require \$33,520,000. Major expenditures will cover construction of a

150,000-kw generating unit and design of another of this size, as well as extension of the company's 115,000-v transmission lines. One new line will be convertible to a 230,000-v system, now in the planning stage.

UTAH POWER & LIGHT COMPANY and subsidiaries plan a construction program of approximately \$21.5-million for 1961. This is another expansion in budget from the two previous years 1960 (\$17.3-million) and 1959 (\$14.3-million).

SOUTHWEST: New, Booming

PACIFIC GAS & ELECT. CO. has projected expenditures of more than \$500-million over the 15-month period running through the end of 1961. The second of two 330,000-kw units at PG&E's Pittsburg power-plant is scheduled for completion in the coming year, and work is beginning at the Morro Bay power-plant on the first of two more such units. These power units, largest in the West, cost about \$40-million each.

SAN DIEGO GAS & ELECT. CO. has set a preliminary 1961 capital expenditure budget of \$29-million, including \$10.5-million for construction of the second South Bay generating unit.

PUBLIC SERV. CO. OF NEW MEXICO has projected a 1961 budget in-

EL&P SURVEY: HIGHLIGHTS OF GROWTH IN '61

- Total Spending: \$3.41-billion
 - Commercial Sales: 123.9-Billion Kwh
 - EEI Advertising Budget: \$2.6-million
 - Number of customers: Increase of 59.8-million
 - No. 1 Problem: Rising Costs
 - Cost of Residential and Rural Electricity remains only 1.3% of Disposable Personal Income
 - Residential Sales: 205.9-Billion Kwh
 - Industrial Sales: 350-Billion Kwh
-

volving construction expenditures of \$13,175,314. Included in this new expansion is \$5,806,171 for work on a third unit (66,000-kw) for the utility's Reeves Station, to be in service by mid-'62.

ARIZONA PUBLIC SERVICE CO. estimates a 1961 construction budget of \$63,900,000. (In 1960, the utility budgeted \$19.5-million for new electric and gas facilities expansion in the first half of the year.) Major projects underway include the company's second major coal-fired plant (a 350,000-kw facility located on the Navajo Indian Reservation, to be on the line in 1963) and a 65-mile, 230,000-volt transmission line interconnecting Arizona P.S. with the Utah Power & Light Co.

NORTHWEST: Catching Up

BONNEVILLE POWER ADMINISTRATION plans a \$19-million construction program for calendar-year 1961, compared to expenditures of \$20.5-million in 1960. Contract construction work is budgeted at about \$4.45-million, compared with \$6.28-million the year before. Contracts proposed for execution in the first half of the year include \$460,000 for 96 miles of right-of-way clearing, \$1.9-million for transmission line construction and about \$2-million for 24 substations or substation additions.

PACIFIC POWER & LIGHT CO., with a \$28.6-million construction outlay planned in 1961, will nearly match the \$29-million expenditures of 1960. Largest portion of the '61

Federal Construction: Big Increases in FY '61

U. S. DEPT. OF INTERIOR—ELECTRIC CONSTRUCTION*

	FY 1960	FY 1961
Generating Facilities.....	\$10,300,000	\$43,300,000
Transmission Facilities	9,724,000	22,790,000
Substations	4,014,000	9,500,000
Total	\$24,038,000	\$75,500,000

* Total cost basis, not including land and land rights, engineering, etc.

U. S. CORPS OF ENGINEERS—ELECTRIC CONSTRUCTION

	FY 1960	FY 1961
Generating Facilities.....	\$143,658,000	\$163,490,000
Transmission Facilities	113,158,000	146,840,000
Substations	21,500,000	16,650,000
Total	\$269,316,000	\$326,980,000

budget total will be used to expand T & D facilities—\$11-million for transmission, \$13-million for distribution. A 230-kv line in Wyoming will account for the largest share of the transmission expenditures; while modernization and extension of a distribution system serving a large U. S. Steel taconite project under development at Atlantic City calls for the largest part of the distribution portion. (In a year-end announcement of a pending merger of Pacific P. & L. Co. with the California Oregon Power Co., officials of the two companies noted that construction requirements of the companies in the next 10 years would total more than \$500,000,000, to nearly double the present utility plant investment.)

PORTLAND GENERAL ELECTRIC CO. will raise to \$16.5-million its expenditures for new T & D facilities in 1961, from a total outlay of \$12,084,000 for this purpose in 1960. (The figures do not include expenditures for starts on new generation facilities.) PGE had spent about \$13-million for general line and distribution construction in '59 budgeted \$11.6-million for '60.

WASHINGTON WATER POWER COMPANY will spend better than \$6.5 million, with \$4-million going to the company's electric system. The largest expenditures will include \$700,000 for extension of electric service to new customers, \$320,000 on transmission line construction and \$110,000 on street lighting.

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AIF-ANS Conferences Hear About Progress Toward Goal:

Key to Competitive Nuclear Power—Getting Most from Reactor Core, for Longest Time, at Lowest Cost

Reports on progress toward the key goal of getting most from a reactor core for the longest time at the lowest overall cost . . . hints at the magnitude of the unprecedented opportunity in the nuclear space power field for industry to surpass all previous technical achievement . . . and a broad range of nuclear energy activities in other areas from pure science to practical power application—these were the accounts given to some 1500 representatives of private industry and government who attended meetings of the Atomic Industrial Forum and The American Nuclear Society (and the Atomfair West) in San Francisco in December.

A report on progress in resolving problems which a year ago stood between the "current" and the "potential" nuclear plant was presented by Dr. Frank K. Pittman, director of the division of reactor development of the U. S. Atomic Energy Commission.

Dr. Pittman announced "significant progress in solving the central problem of competitive nuclear energy—getting the most power from a reactor core for the longest time at the lowest overall cost." He said:

"We are beginning to accumulate statistically important irradiation data—not only from capsules and in-pile loops but more importantly from large-scale operating reactors like Shippingport, Dresden and Yankee—on the more or less conventional fuel and cladding material. Available evidence is that uranium oxide can stand extremely long exposure, with perhaps an upper limit in the range of 60-70-thousand MWD/T.

"It now is believed possible to provide metallic fuels for use at temperatures in excess of the 1200 degrees Fahrenheit minimum considered by many to be necessary for power production.

"Work on uranium carbide as

fuel material has been carried out in many laboratories with marked success.

"Use of powder metallurgy techniques to develop alloys and ceramics of aluminum as a fuel cladding and core structure material seems assured with the development of satisfactory commercial sources and of satisfactory techniques for closure and welding.

"Use of zirconium as a fuel cladding and core material has not progressed as rapidly as we had hoped. We still are pursuing an active development program aimed at reducing still further the cost of reactor grade zirconium and improving its high temperature mechanical properties and resistance to corrosion by steam."

"The United States must lead the world in advanced nuclear technology," declared Congressman Chet Holifield of Los Angeles, vice-chairman of the Joint Committee on Atomic Energy, and scheduled for the chairmanship in the coming session.

As to the nuclear frontiers in the

1960s he asserted that our policy should be "leadership and urgency but not recklessness—calculated speed but not waste."

In his keynote address, Rep. Holifield emphasized the importance of developing nuclear power for application in outer space programs and advocated increasing our nuclear rocket propulsion engine capability; more concerted effort on development of nuclear power devices for the supply of auxiliary power for space vehicles.

Francis K. McCune, retiring president of the AIF and vice-president of General Electric's Engineering Services, predicted that America's industries have an opportunity in the nuclear space power field to surpass all their previous technical achievements. Significant steps in development of nuclear power sources for space vehicles have already been made and the successful completion of three static ground tests in connection with the Rover project must be taken as major technical achievement," he noted.

Industry—AEC Relations Reviewed

Stephen P. Cobb, executive of the nuclear energy committee, Na-

W. Kenneth Davis (at rostrum), vice-president of Bechtel Corp., presided over a general session of the AIF conference devoted to "Problems in Initiating a Power Reactor Project." The speakers (l. to r.) were: Ray E. Untereimer, professor of the dept. of economics, U. of California; B. John Garrick, chief nuclear scientist, Holmes & Narver, Inc.; Louis H. Roddis, Jr., president, Pennsylvania Elec. Co.; and Sidney M. Stoller, a consulting engineer of N. Y.



tional Association of Manufacturers, asked: Are private facilities being utilized to the best extent as regards production and procurement of goods and services, or is the work being performed to too large an extent in government-owned facilities?

Mr. Cobb pointed out that the "Atomic Energy Act of 1954 states as one of the U. S. policies that the development, use and control of atomic energy shall be directed to strengthen free competition in private enterprise." Then he charged that "actual implementation of this policy by the AEC has not been consistent."

He declared there are reasons for the inconsistencies and explained:

"This business concerns itself with scientific and engineering problems of amazing complexity and also is surrounded by a maze of administrative rules and regulations well in excess of other heavily regulated industries. It suffers from a high order schizophrenia—on one hand it is attempting to develop a normal competitive industry; on the other the government in many cases is the only customer for the industry and the government totally owns and allocates the basic raw material."

Mr. Cobb cited examples to show that in some cases the cost factors used by industry and the AEC are not the same. And he added:

"This shows need for some sort of evaluation of industrial and AEC cost principles with a view toward making them more comparable. It also shows that industry, operating on a unit price bid, must include a risk factor that AEC does not have to do. The AEC, operating on a 'best efforts basis', assumes no risk and thus can come up with projected costs lower than industry's."

"One recommendation to help this situation would be for AEC, in determining its costs for a given operation, to segregate it completely from all other operations already in existence. This would result in a more equitable comparison of overheads."

In closing, the NAM representative declared:

"The AEC staff must agree and want to develop a private nuclear



Nuclear industry "summit meeting" is held informally by Myles C. Leverett, president of ANS and Francis K. McCune, president (retiring) of AIF.

industry. An atmosphere of willingness to have such growth will be far more effective than to have it forced on AEC by outside pressures."

B. John Garrick, chief nuclear scientist, and Wayne J. Costley, project scientist of Holmes and Narver, Inc., jointly discussed this problem: How can an applicant for a reactor operating license provide the AEC with reasonable assurance that the use of his facility will not be inimical to the health and safety of the public?

Their advice included these suggestions: "In putting together a team to develop a reactor project, safety must be emphasized equally as much as reactor design. The two must go hand in hand in order that the public be protected and the design can be optimized throughout its development in light of the safeguards that it requires."

"At the time when a permit is needed to begin translating ideas from the drawing board into physical reality it is necessary to demonstrate that a reactor of the type chosen can be built with safety on the site in question. It is the responsibility of the applicant to set down what is known about the reactor, which of its features are already an established part of reactor technology, what research and development will be undertaken to provide information on its less certain features."

"Selection of a site can constitute the greatest single barrier against serious mishap, yet its selection must be made very early in the life of the project and on the basis of rather nominal information. Yet, a thorough safety analysis should be made . . . and the applicant should recognize that the information accumulated benefits him more than

it does the AEC," the Holmes and Narver representatives counseled.

Fritz F. Herman, counsel for the atomic power equipment department, General Electric Company stated:

"The Nuclear safety issues are on the frontiers of technology. For that reason they frequently raise complex questions of technical judgment. In government, in the universities and in industry these questions have challenged some of the most talented of the nation's scientists and engineers. Effective analysis and resolution of these problems requires either qualification in the technical disciplines or the advice of persons possessing such qualifications. So there seem to be three choices:

"1. To continue the present practice of initial decisions by an Examiner who does not have an opportunity to consult a technically trained staff expert except through the cumbersome process of formal presentations on the record. In many cases this means that the initial decision will be a formality because of an understandable hesitancy to depart from the expert view of the hazards evaluation staff and the Advisory Committee on Reactor Safeguards."

"2. To permit the Examiner to obtain technical advice from the original reviewing staff or from an independent group. Let me emphasize that the whole group of advisors, and not just one or two would be required, because the review of the safety problems of a reactor need specialized competence in a large number of technical disciplines."

"3. An initial decision by the Commissioners acting on the advice of the original reviewing staff."

Propose AEC Reorganization

A proposal of the Atomic Energy Commission be split into two agencies was presented by William H. Berman and Lee M. Hydeman, co-directors of the atomic energy research project of the University of Michigan Law School. They recommended:

1. An Atomic Energy Administration headed by a single executive who would be responsible for conducting the AEC's operational



"Atomfair West" exhibits attracted hundreds in the San Francisco activities of the atomic industry. One of the more extensive displays, this Westinghouse exhibit demonstrated services for "complete nuclear powerplants."

and promotional functions.

2. An Atomic Energy Board which would assume the present safety regulating functions of the Commission, including making rules and deciding licensing cases.

The principal purpose of the recommendation is "to permit the atomic energy industry to benefit from a regulatory system that is not unduly burdensome." Among other advantages promised would be "increased public confidence in the operations of the industry."

The U. of Michigan authors presented a paper titled "The Impact on Industry of the AEC's Conflicting Promotional and Regulatory Functions." They urged "a good look at the regulatory system that has developed and at the organizational framework that has given rise to the system, in order to determine if the system is conducive to expeditious industrial growth."

Messrs. Berman and Hydeman quoted one observer's comment that "never has a government agency been directed to present so many faces to industry at the same time and never were the resulting relationships between government and industry so complex." They added: "The burden of the total responsibilities of the Commissioners is too great to devote adequate time to regulatory problems. The other possibility is that self-consciousness about their combined promotional and regulatory functions has led them to shy away from more active participation in licensing matters!"

Overseas: Long-range Plans

At a general session covering "Nuclear Developments Abroad: Changing Times," prospects for a nuclear industry across the seas were discussed.

EURATOM—Curt Heidenreich of Brussels:

"In the long term there will be need for a sizeable quantity of atomic power. Therefore, we feel it is indispensable to have in the community a number of full-scale reactors so our engineers can learn their trade and we can improve our knowledge of the economics of nuclear energy."

FRANCE—Andre Hannotiaux:

"The nuclear policy of Electricite de France calls for doing enough in order to be ready in due time, but avoiding the wasting of money by doing too much. We will build only prototypes until the day when the cost of nuclear kwh is competitive with the cost of conventional power."

"My own guess is that it will be around 1970. We in France are not too pessimistic about the possibility of producing nuclear power at a competitive price."

JAPAN—Juzaburo Tereda:

"Both government and industry in Nippon started work at the beginning of 1960 to revise his country's nuclear program. This new program covers 20 years, with a major goal: installation of 1-million kw of nuclear capacity in the first decade."

American Nuclear Society Sessions Draw Over 1000

A wealth of technical information was presented to over 1000 delegates in 42 sessions of the American Nuclear Society. Among the significant views and revelations were these:

Dr. Edward Teller, University of California's professor of physics at large, urges that a study be made of the feasibility of locating nuclear power plants underground to protect them from atomic attack. Although the idea is dismissed by some as too costly, he said, the plan actually may be cheaper than constructing such plants on the surface. And such an indestructible stockpile of nuclear energy could be the key to America's recovery after a war.

Plans for disposal of radioactive waste into deep geologic formations were described by the Oak Ridge National Laboratory's Wallace De Laguna, who stated that disposal into salt is the method favored by many geologists and in particular by the Committee on Radioactive Waste Disposal of the National Academy of Sciences. Salt deposits are widespread in the United States and the salt composing in them is, with few exceptions, impermeable. He noted that it would be possible to move out or dissolve out cavities in salt and then introduce radioactive waste, using the salt not only to contain the waste but also to support the overburden and seal out the ground water.

A "neutron telescope" was described by Samuel Untemyer II, consultant at the Vallecitos Atomic Laboratory at Pleasanton, California, a component of General Electric's atomic power equipment department. The sensitive electronic device, developed by Mr. Untemyer at Vallecitos enables nuclear engineers to "look" through the thick steel walls of an atomic reactor to see how much steam it is producing. He announced it as another step by GE toward simplification of present reactor instrumentation and described it as "basically a fast neutron counter in a special tube which can measure small differences in the steam output of

(Continued on page 63)

Remote Nuclear Power Projects—ANS Hears Newest Reports

Many of the nuclear power projects described for ANS delegates might be characterized as "way out," for remote installation requirements motivated several plans; including one designed for installation on the moon!

Brief descriptions of these less "conventional" nuclear plants follow:

1. Performance tests covering power output, parallel operation and radiation surveys were completed in October and a 400-hour endurance test was finished November 5 for a pressurized water nuclear plant designed for installation and operation at Camp Century on the Greenland ice cap. The design, testing and erection of the portable modular nuclear power station for this remote Arctic site was outlined by W. J. McCool of Alco Products Corporation.

This station—a PM-2A—was planned for assembly in modules limited to 9 feet by 30 inches and 30,000 pounds and must withstand transportation at 20 degrees below zero and storage at 50 below zero. It is rated at 1560 net kwe, plus 1,000,000 btu for heating from a 2000-kwe gross plant.

The design had to overcome these problems: (1) Dissipation of condenser heat to the air. An intermediate glycol solution was used. (2) Use of snow for secondary shielding. (3) Preventing excessive gamma heating in primary system foundations and surrounding snow. (4) Design of skids and equipment to withstand impact requirements and low temperature requirements. (5) Plant arrangements to fit lineal limitations.

Assembly of the PM-2A started June 17, 1960. The ship carrying the plant docked at Thule, Greenland, July 10. The final units were received at Camp Century July 28. Testing began during the third week of August. Critical loading commenced September 26.

2. An unattended nuclear power plant for remote locations was the subject of David F. Cope of the Oak Ridge National Laboratory.

Mr. Cope declared that nuclear

plants are attractive for remote areas because they can produce electricity for long periods without refueling and, if made sufficiently reliable, they might be designed to operate unattended.

The specific question studied, he said, was the feasibility of an unattended system for supplying a one megawatt load for one year. An imposed requirement was that the plant be available for field use in about four years. The cost, weight, efficiency and reparability were assumed to be of secondary importance to reliability.

A highly enriched pressurized water reactor with a conventional steam power system was selected, because a program to develop a reliable reactor in a limited time "should be based on proven concepts and proven technology," the ORNL representative noted.

The primary system, which is hermetically sealed, is composed of the reactor core, coolant pump, pressurizer and heat exchange. A burnable poison limits gross radioactivity change and the negative temperature coefficient compensates for changes not eliminated.

3. Studies comparing the costs of nuclear and conventional power at a dozen remote military establishments have been completed by Kaiser Engineers. The results were told the convention by Joseph Finke of that firm.

The generating capabilities in ten of the studies ranged from 5000 to 40,000 kilowatts and two were less than 5000 kw.

Some of the criteria used were: fixed charges, consisting of straight-line depreciation over an assumed 20-year lifetime; no taxes, insurance or interest on investments; no charge for use of nuclear fuel.

Total costs to military services for a nuclear plant were appreciably less than for a conventional plant in Okinawa, Thule and the three Antarctic sites. Total costs were approximately equal for Guam and the Nike-Zeus sites. In the other cases the costs for conventional plants were less than for nuclear plants.

4. Now for a nuclear power plant on the moon!

A reactor for such a plant, designed by Argonne National Laboratory engineers, was described in a paper presented by J. C. Carter, a senior mechanical engineer of the staff of Argonne's Reactor Engineering Division.

The design of the lunar power plant closely resembles that of Experimental Breeder Reactor 1, which has been in operation since 1951 at Argonne's Idaho Division of AEC's National Reactor Testing Station.

Mr. Carter gave the delegates these descriptive details:

The reactor is capable of supplying one megawatt of power for a lunar base camp.

Because it could be placed below the ground, no shielding is provided and the blanket customarily used in breeder reactors is eliminated inasmuch as there is no necessity to breed additional fuel.

A novel feature of the reactor is the radiator to dissipate unwanted heat. It would be wrapped around the reactor during transport by rocket to the moon and then extended when the plant is placed in operation.



The first nuclear powerplant in the Antarctic is scheduled for shipment to the site in prefabricated sections during November, 1961. Here's what PM-3A will look like when installed on a ridge overlooking the Naval Air Facility at McMurdo Sound, principal base for all U. S. scientific efforts on the southernmost continent. The 1500-kwe plant is being built by the Martin Co. under contract AEC.

(Continued from page 61)

ected fuel channels in the nuclear reactor. Mounted above the core of the reactor, it can be aimed accurately at a fuel channel from a distance of 20-feet or more and will count fast neutrons coming up out of that section of the reactor through six-feet of water and several inches of steel.

Five of the devices have been installed at the 180,000-kilowatt Dresden Nuclear Power Station, built for Commonwealth Edison Co.

Weaver Heads AIF

Charles H. Weaver of Pittsburgh, vice-president of Westinghouse Electric Corporation, was elected president of AIF for 1961, succeeding Francis K. McCune, vice-president of Engineering Services for General Electric Company, who was named an honorary director.

Vice-presidents of the Forum are: James F. Fairman, senior vice-president of Consolidated Edison Company; Roy M. Casper, vice-president of Allis Chalmers Manufacturing Company; Phillip Sporn, president of American Electric Power Service Corporation.

Other officers re-elected are: Charles Robbins, Executive Manager and Secretary; Malcolm Tait, treasurer.

Directors elected for three-year terms are: James M. Gavin, president of Arthur D. Little, Inc.; E. V. Turphee, president of Esso Research and Engineering Company; Louis H. Roddis, Jr., president of Pennsylvania Electric Company; Julian M. Shapiro, president of Nuclear Materials and Equipment Corporation; Henry D. Smyth, chairman of Princeton University Research Board; Shields Warren, of the Cancer Research Institute, New England Deaconess Hospital; Hood Worthington, technical director, Atomic Energy Division, E. I. du Pont de Nemours and Company; Hubert W. Yunt, executive V.P. of Liberty Mutual Insurance Co.

W. Kenneth Davis, vice-president of Bechtel Corporation, was elected director for a one-year term. John Floberg, general counsel of Firestone Tire and Rubber Company, was named for a two-year term. Chandler C. Ross, vice-president of Aerojet-General Corporation, was appointed by the board to serve until the next annual meeting.

PCEA-PCGA Administrators Conference Looks Hard At Rates, Regulation, Operating Costs, Billing

Controversy in public discussion? Little was limited in the free-wheeling expressions that characterized the sessions of the PCEA-PCGA Administrative Services Conference held at Scottsdale, Arizona, in December.

Perhaps most of the controversial subject matter was covered in the two days of discussion on the "Economics of the Utility Industry." (However, in another section, the always sensitive area of buyer-supplier relations was explored in an unusually frank and open manner—see story on page 30.)

There was considerable advice offered to regulatory commissions. Homer R. Ross of the Southern Counties Gas Co. of Calif. challenged the commissions to avail themselves of "real opportunities to minimize public resistance to necessary rate increases occasioned by rising utility costs." He urged a shift in the method of utility property in the direction of fair value, permitting an adequate return based upon legitimate financial requirements without raising the rates of return considered subjectively "reasonable" by the public.

Mr. Ross also had advice for utility management, suggesting that it choose methods of operation which, although limited by overall economic considerations, will maximize the earnings base, rather than in just "trading dollars."

Ross J. Cadenasso, of Blythe & Co., Inc., summed up his view of the public utility industry's future this way:

"Poor regulatory climate in some areas has prevented the attainment of adequate returns by some companies. Reluctance and delays on the part of management in seeking rate increases where needed and justified have resulted in substandard returns being reported by some utilities. The downward trend in the postwar period in the electric industry's return on average net utility investment has caused concern especially since the cost of senior capital has been rising. Increases in operating efficiency have helped overcome some of this; however, there is doubt among some

students of the industry that future technological advances will produce the same rate of improved efficiency as in the past.

"We believe, however, that with an efficient management and a constructive regulatory attitude which recognizes the need for a fair return allowance, the public utility industry should be able to satisfy its customers' burgeoning demands for service in an economical and efficient manner and at the same time maintain a safe and rewarding haven for a significant portion of the savings of the American people."

Mr. Cadenasso expressed encouragement in another trend where, in a number of cases recently commissions have tended to cut down on the "regulatory lag" by permitting the use of the rate base at the end of the test year instead of the average for the year, or going further, permitting use of the estimated average rate base for the current year. "This one year's advance can be quite significant to a fast growing utility and may have the effect of using a rate base around 10-percent higher than otherwise," he indicated.

Mr. Cadenasso noted that in recent years in California the Commission has permitted the use of a forecast year, the first full year in which the new rates are to be effective, as a test year, saying that this procedure has considerable merit as an approach to a solution to the problem presented by regulatory lag.

Purpose of Regulation

W. D. Brooks, of the Tucson Gas, Elect. Light & Pwr. Co., discussing the determination of rate of return noted that in businesses other than public utilities, the value of the business is very often determined by its profits, with little or no consideration given to the original cost or reproduction cost of any physical property used in the business. To apply this method to a regulated utility would mean that Commissions, by changing rates and correspondingly the return, would con-

trol the utilities value—actions which are contrary to the purpose of regulation, he observed. "By the same token, to reverse the procedure and establish rates and the resulting rate of return based wholly or largely on a value whose chief claim to existence is that it is historical, and in the same process disallowing as expenses items that nonregulated businesses would consider as normal costs of operation, seems to be in conflict with the premise of substituting regulation for competition," said Mr. Brooks.

W. M. Gallavan of PG&E referred to past decisions of The California Public Utilities Commission which, he said, indicate that the utility should be given latitude in determining the spread of rates as between classes and customers. He advised: "In these times of rapid technological progress, a rate designed as a mathematical formula or by historical trending will lead to a rigid set of rates that does not fit the needs of the utility nor of the customer. The rates for the future should be flexible and adaptable to the requirements of both the utility and the customer."

Re the "Right to Manage"

Geo. S. Coates, of Southern Counties Gas Co. discussed "Allowable Operating Expenses." Summing up the significance of a regulatory body's effect on this area of a utility's operations, he declared: "If a Commission's attitude is unreasonable, earnings will be affected and long-term benefits can be sacrificed on the altar of short-time savings."

Mr. Coates reviewed recent expressions of the California Commission regarding expenditures for sales promotion, insurance coverage, charitable contributions, salaries and fringe benefits, particularly as they include "some recognition of Management's right to manage its own business."

He suggested this result: "If the amount allowed for operating in your area of responsibility in your company is drastically reduced by the regulatory commission of your state, how you operate is going to change. Management, when confronted with a choice of continuing an activity or keeping earnings at a satisfactory level, has little choice,

even though over-all it is convinced it is to the best interests of the ratepayer and the shareholder to continue the operating expenses at a higher level.

"What can we do that will help us bear scrutiny and from time to time withstand challenges? This is an area all of us can help. We can conduct our business in a business-like way and we can keep our records so that they supply the facts we need when we need them, but perhaps more important, we can control our expenses," Mr. Coates advised.

Dangers in Budgeting

J. S. Long of Northwest Natural Gas Co. cited advantages of budgeting in controlling and reducing corporate costs. At the same time, he conceded, there are "potential dangers" in budgeting, such as:

(1) the failure to accept genuine opportunities because the costs which they entail are not provided for in the budget, (2) the failure to reduce costs because expenditures are running within budget limits, and (3) the tendency to ask for all-out expense reduction efforts, to agree to the reduced budget so achieved, and then to insist on further reductions.

Mr. Long suggested: "Across the board budget cuts should be avoided. When management orders a reduction of, say 10 percent in all budgets it confesses its inability to attack costs intelligently and to merit the cooperation of all department managers. The injustice brought about by the uniform-percentage cut is evident when we consider the different characteristics of the various departments. It may be feasible to reduce some by 15 percent and shortsighted to trim others by even 5 percent."

In a discussion of legal aspects of rate making, John S. Cooper of PG&E recalled that surprisingly few rate proceedings on the state level are appealed. Moreover, he noted, of the cases that are appealed, only a very small number are reversed by the courts. He observed that the main reasons for the scarcity of court cases related to state decision in recent years are that the decisions have generally been considered satisfactory to all parties concerned, and, secondly,

the state regulatory agencies have been granted extremely broad statutory powers and the local courts have not been prone to overturn the local commission's decision unless federal or state constitutional rights have been violated.

John H. Geiger of the Pacific Power & Light Co. expressed this view: "Fortunately for the industry you and I serve, the public has apparently seen through the illusions of the public power income statement. These are encouraging signs that the citizenry of the Pacific Northwest have a good understanding of the real issues. Employees of the electric utility industry can do a good deal to insure an enlightened public by taking steps to fully understand the issues ourselves and informing others. The income statement is a good place to start in seeking many of the answers."

M. W. Hart of the California Elect. Pwr. Co. proposed utilizing the response to the routine customer accounting inquiry as a good time to promote the advantages of the investor-owned utility business as opposed to tax-free competition. He put it this way:

"There is one customer inquiry that stands out above all others and it usually comes in under the guise of a routine accounting question: 'Why is my bill so high—and—can the government do it cheaper?'"

"I'm going to sell this man on the desirability of free enterprise and I can back up every fact and prove every figure."

"I show my customer the dividends my company has paid for several years. If he is interested I explain to him the various types of stock and explain the advantages and disadvantages of each. If he thinks the dividend is high (few think so), he can buy all he wants on the open market. Most customers don't want to risk their money for such a modest gain. If he does buy stock in my company that is good, too."

"Next I go right down our Balance Sheet and Profit and Loss Statement from our Report to Stockholders. Under each item the customer receives detailed examples such as the cost of a special transformer, a meter, a particular service, a line truck, a lineman

urly pay, or a meter reader's
urly pay. He is told the cost of
mployee benefits and he is given
her information in which he may
interested. He may be interested
current operating or construc-
on problems. He can divide our
annual or monthly district operat-
g cost by our number of custom-
s and see the amount per custom-
. He can understand generating
sts, he can understand transmis-
on losses, and he can understand
ansformation losses, if you will
ly explain them in simple lan-
uage. He can even understand
preciation, inflation, and general
ffice overhead. Give him a chance
make a well informed decision
and the decision will be in your
vor."

In a discussion of "Legal Tools
Collection," Frederick K. Stein-
e, Jr. warned that every collection
ort is accompanied by some
sk of creating a counterliability
against the company through inten-
onal wrongs, mistakes or viola-
ons of government regulation.
uch risk can be minimized by
nowledge and care in using cour-
esy, caution and common sense,
e advised.

Customer Inquiries

R. L. Abbott of the Tucson Gas
lect. Lgt. and Pwr. Co. included
ese suggestions in his presenta-
on on customer inquiry handling:

1. Every effort should be made to
void possible customer inquiries
y prebilling preparation, high-low
eck and investigations to assure
s high a rate of accurate billing as
ossible.

2. Any changes in company poli-
y should be carefully reviewed in
egard to the effect on customer
elations. It is not always possible
o avoid irritating customers in
uch cases as rate increases or
ghtening of credit policies, but the
mpact may be softened in many
ases by considering the customer's
osition and preparing accordingly.

3. Adjustments in billings should
only be made when justified by
onditions disclosed by the investi-
ation, and not just to satisfy a diffi-
ult customer. If this policy is not
hered to, the utility could invite
umerous inquiries from friends of
e customers favored by an un-
arned credit to his account.



Management Tests Now Show That *Truco* Turret Derrick Cuts Manpower Costs in HALF!

Shown above is a three-stage Truco Turret Derrick with a special 4' x 6' aluminum platform recently purchased by an electrical contractor in the western mountain states. With this single unit, this contractor set a series of 90' poles—each weighing 5,000 pounds including the crossarms, insulators, and all pole hardware in place. After poles were set, placed and tamped, a three man crew (two on spacious platform, one on ground) clipped in the high tension conductors. Not one single lineman climbed a pole during the entire project.

By using one truck mounted combination Truco Turret Derrick and a 3-man crew, this contractor replaced 6 men, 2 vehicles and 4 arm ladders—and did the job safer, faster and surer at a cost savings of more than 50%! This Truco utility derrick tool paid for itself on the first few jobs.

INVESTIGATE the savings *you* can make on *your* aerial jobs — in dollars, manpower and time. See your Truco dealer or write for details.

TRUCK EQUIPMENT COMPANY

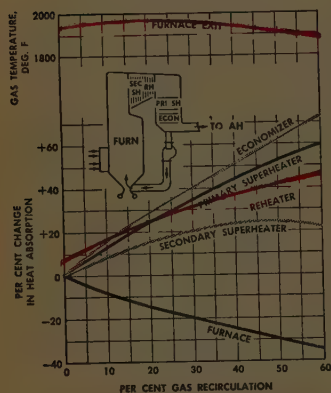
"The COMPLETE Line of Utility Equipment"

3963 Walnut Street / AC 2-7905 / Denver 5, Colorado

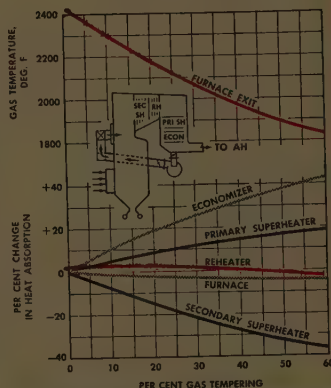
*Now—precise heat and temperature control
—where you need it and when you need it*

EFFECT OF GAS CONDITIONING

**Effect of
Gas Recirculation
in Hopper
(Constant Firing Rate)**



**Effect of
Gas Tempering
at Furnace Exit
(Constant Firing Rate)**



B & W GAS

**B&W engineering concept tempers
furnace exit gases and controls
absorption patterns for improved design,
operating and maintenance
characteristics**

Just as the heating and cooling systems in your home condition air to provide a moderate, healthful atmosphere under the "load" of varying climate . . . B&W Gas Conditioning provides moderated, balanced gas temperature in the boiler under varying conditions of load, changes in fuel characteristics, and varying cleanliness of heat absorption surfaces.

Gas Conditioning is the composite use of "cool" flue gases recirculated either to reduce gas temperature at the furnace exit (gas tempering) or to control heat absorption relationships between the furnace and the superheater/reheater surfaces (gas recirculation).

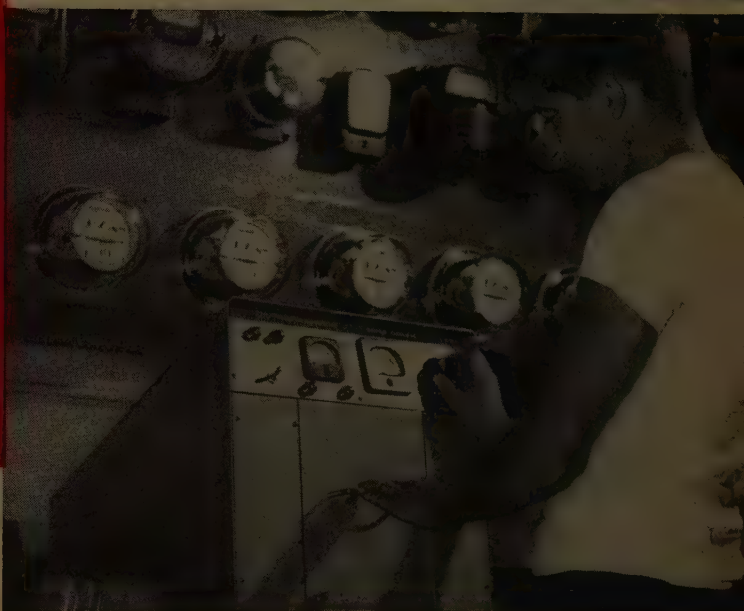
Increasing load normally brings up gas temperature



HISTORIC QUINCY, MASS. (top right), home of John Adams and John Quincy Adams. Both presidents are buried in the United First Parish Church, shown here.

AT WORCESTER COUNTY ELECTRIC CO. the F.P. Series 6100 Calibrator (right) is being used for setting foot candle operate values. As the operator gradually varies the light intensity, a front panel light indicates control operation and a foot candle meter shows the operate value. Short time delay in F.P. controls permits fast checking here and in the field.

NEW SERIES 6700 CONTROLS (bottom right) installed on 240-volt lines by Narragansett Electric Co. in Providence, R.I. These controls use the basic 6600A circuit, as modified for 240-volt operation.



For complete design information and operating specifications on Series 6600A and 6700 controls, and the Series 6100 Calibrator, write The Fisher-Pierce Co., 81 Pearl Street, South Braintree 85, Massachusetts.



FISHER PIERCE

Electrical and Electronic Equipment for
Industry, Utilities and the Home

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

MAKING HISTORY, New England Electric participated in building one of the nation's first atomic electric plants. The 136,000-kilowatt Yankee Atomic Electric plant at Rowe, Mass., is now in operation.



"English-Speaking" Computers' Data Interchangeable

The first computer programs utilizing plain English have been successfully interchanged on data processing systems of different manufacturers.

A report of the development followed a two-day demonstration by the Remington Rand Univac division of Sperry Rand Corp. and the RCA Electronic Data Processing division before the Executive Committee of the Conference On Data Systems Languages, a government-sponsored group formed to achieve computer compatibility.

The demonstration used COBOL, the Common Business Oriented Language which is basically a system which employs simple English words to instruct the computer—as opposed to the complicated machine code understood only by computer specialists.

In the demonstration, two programs, one by each manufacturer, were prepared and automatically fed into the data processing equipment of the manufacturer that prepared the program. Then, with minor modifications, the programs were prepared and fed into the other equipment. In both cases, the results agreed.

A compiling system operates in this fashion: the computer is programmed to accept nouns chosen by the user that are related to the business involved—for example, *payroll file, wage, tax, employee number*. The computer is also programmed to accept some 20 verbs that serve as commands—*write, read, divide, add, display, or move*, along with conjunctions that link the verbs to the plain English nouns. The word *if* can tell the computer to make comparisons of data and execute logical decisions as a result of the comparisons.

The English words are transferred to magnetic tape and fed into the computer for action.

A simple command, now given as "Subtract Deductions From Gross Giving Net," would formerly have been fed into the RCA 501 as 72-010237-00-600000 and a pair of other numbers equally as long, or into the Univac II as B00549 S00623 C00942.

A-C Builds New Sound Lab

The search to attain lower noise levels and decreased vibration in equipment will be facilitated by Allis-Chalmers sound research laboratories at their Norwood, Ohio, works. While developed primarily for testing its own products, such as motors, generators and pumps, A-C plans to make the facility available to other firms who have noise and vibration problems.

The new facility will have the capacity to test a-c



Noise and vibration levels are measured in this fully instrumented control room at the Allis-Chalmers Norwood works sound laboratory.

motors up to 900 hp and d-c motors to 300 hp.

The sound chamber is of the reverberant type with inner walls and ceiling of 8-in. poured concrete on a separate foundation surrounded by outer walls of 8-in. concrete block with a 6-in. minimum space between. While a difference of 10 db sound attenuation is required as adequate for normal testing, between 40 and 50 db will be achieved in the new chamber.

Provision has been made to isolate the sound room for radio interference testing. This has been accomplished by means of grounded copper wire mesh screen which completely surrounds the interior building.

Sound pressure readings are taken and converted directly into sound power terms. Readings do not need to be integrated over the measuring area as do those taken in an anechoic type chamber in order to predict what may be expected at the place of installation of the equipment.

GE, Westinghouse To Probe Alleged Price-Fix "Damages"

Spokesmen from both General Electric and Westinghouse have stated that they will each conduct a voluntary investigation to determine if any damage was incurred by customers as a result of alleged violations of Federal anti-trust laws. Private, public, municipal, and co-op customers will be checked under nation-wide programs.

The companies said that they will individually consult with customers who purchased equipment between 1956 and 1959. The actions came following

ity pleas accepted December 8 in Federal District Court in Philadelphia.

Mark W. Cresap, Jr., president of Westinghouse, said, "We believe that all customers at all times received full and fair values. . . . Without the values and technological advances provided by manufacturers, the price of electricity today would be almost double the actual cost in cents per kilowatt-hour."

"However, the actions charged in the suits are contrary to long established Westinghouse policies, and no employee was authorized to endorse or participate in any joint activity with competitors which reflected on prices and markets. Therefore, the management of Westinghouse considers it an obligation to learn, through these cooperative studies with customers, whether any actions contrary to company policy reacted adversely upon customers."

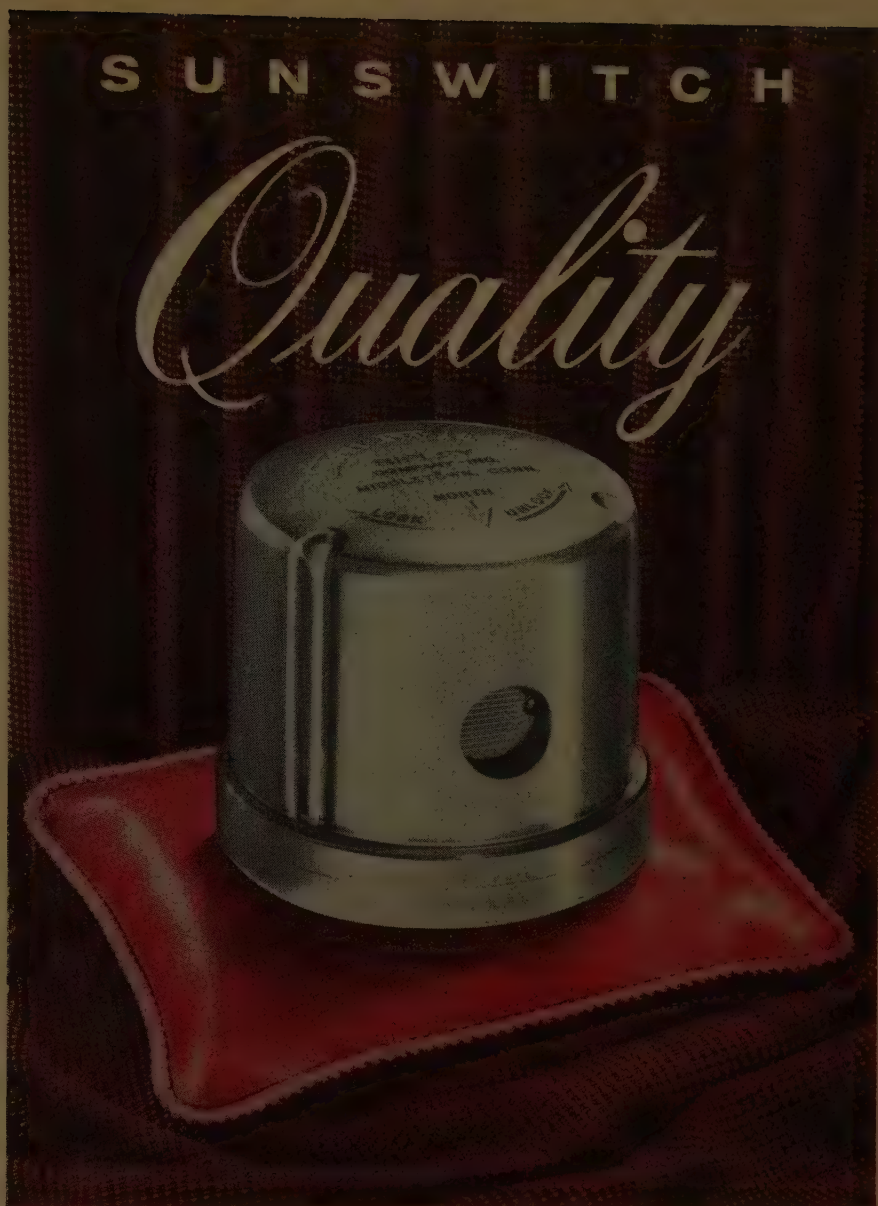
GE's Ralph J. Cordiner stated that GE has traditionally stood squarely behind its products made and sold to customers. If these products prove defective, he stated, it is General Electric's responsibility to take whatever remedial measures are appropriate, in the light of applicable warranties.

"In a similar spirit," he declared, "we accept responsibility to explore with our customers the implications of these unauthorized actions which are contrary to our written Directive Policy 20.5, and reach a mutually agreeable conclusion as to what actions, if any, on our part may be called for in the light of the circumstances."

Produce Reduced-Cost Lighting Program

A four-step program to sharply reduce lighting costs for industrial concerns, commercial establishments, and institutions has been initiated by Westinghouse. The program is based on results obtained from studies performed of actual installations, and showing that almost 90 percent of total lighting costs are relatively fixed and beyond control. About 75 percent of lighting cost is made up of the cost of power and 15 percent by the cost of maintenance. Only the direct

(Continued on next page)



THE NOT-SO-MAGIC INGREDIENT

Quality in a product is never an accident. It requires integrity and seasoned judgment, as well as industry. Attention to detail determines the difference between the ordinary and the outstanding.

Over the past 25 years, as pioneers of the automatic street lighting control, we've tried to make our business a "quality" operation . . . plus service. Result: a steady increase in sales year-in and year-out!

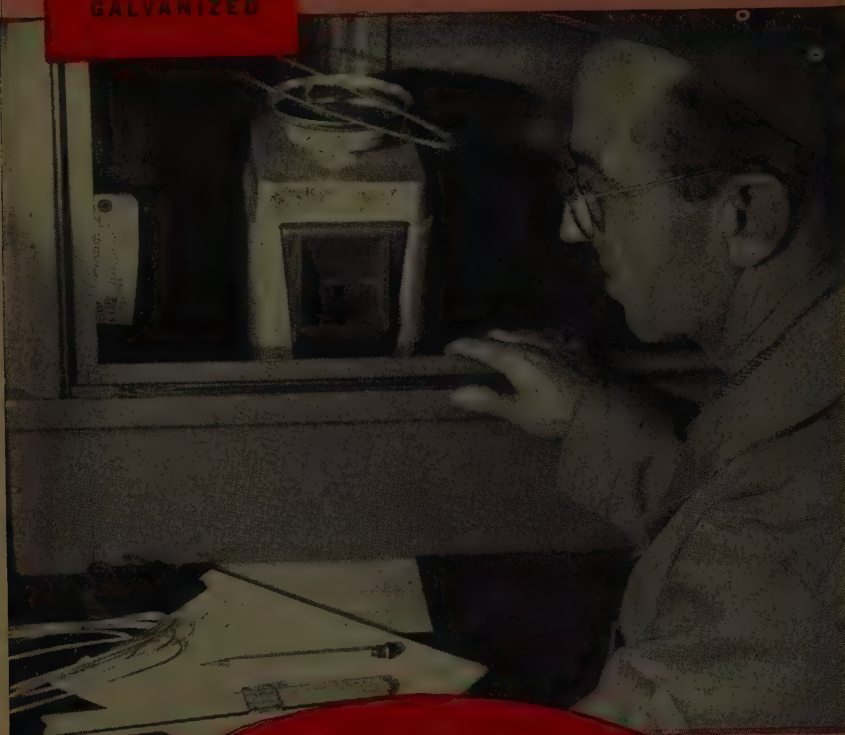
But, as a famous baseball pitcher once put it: "A fellow doesn't last long on what he has done. He's got to keep on delivering as he goes along."

We sincerely intend to keep delivering.



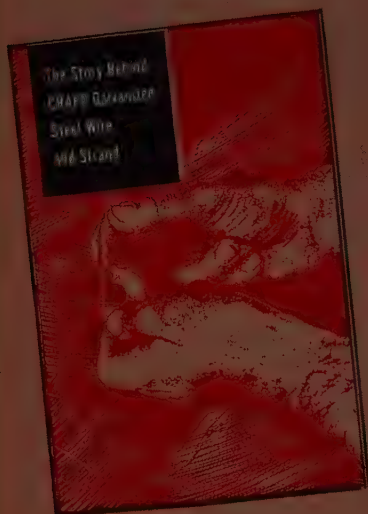
Crapo
GALVANIZED

STEEL STRAND



WEIGHT OF COATING TEST

...added assurance of dependability



The life of galvanized steel strand depends primarily upon the weight and quality of the zinc coating. The heavier the coating the longer the strand will last.

The wire used in CRAPO Galvanized Steel Strand is regularly subjected to the hydrochloric acid antimony chloride, or weight of coating, test. By means of this test the amount of zinc on the surface of the wire can be accurately measured.

This is but one of the many laboratory tests to assure consistently high, dependable quality in the finished product.

AVAILABLE IN 3 COATING WEIGHTS

CRAPO Steel Strand is regularly furnished in all standard sizes and grades and in Class A, B and C coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

Write for this FREE BOOKLET!

"The Story Behind CRAPO Galvanized Wire and Strand" describes and illustrates manufacturing and testing techniques. Ask for Booklet B-59!



INDIANA

STEEL & WIRE CO., INC.
Muncie, Indiana

Lighting Program . . . Cont'd

lamp cost is flexible.

Step one is the proper selection of the best lamp for use in the existing fixture, with a lower list price, longer average life, higher lumen output, or a longer "in-service" life.

Step two deals with reducing relamping labor costs through initiation of a tailor-made relamping program.

Step three is the increase of lighting levels at the same or lower costs.

Step four includes a more efficient use of power. This may involve using fewer lights of greater lumen output.

EIC Meeting Held

Reduction in curing time and temperature for silicone varnishes, development of silicone molding that will withstand continuous temperatures of 700°F, marketing of silicon rubber sealing compounds that cures at room temperature, and the wide application of glass tapes for binding armature windings were some of the highlights discussed at the Third Annual Electrical Insulation Conference held in Chicago.

Class H varnishes can now be cured at 150°C in six hours, making it more practical for use in utility applications since curing ovens are no longer necessary.

Silicone molding compounds which will withstand thermal shock over a temperature range from -67°F to 700°F have been developed which should find unlimited usage, provided metals can be developed to withstand the same range of thermal shock.

Research and Development Center Announced

A "Golden Years Center" for research and development was proposed at the meeting. It would be built in Ridge Manor, Fla., as a complex of laboratories where qualified retired personnel could continue their careers on a part-time basis. First facility scheduled to be an electrical insulation industry standardization lab. It is to be started in 1962.

NEW PRODUCT DESIGN

Suspension Insulators

Weight savings and corrosion resistant qualities in industrial and marine atmospheres are offered by use of aluminum caps and studs. A. B. Chance Co.'s 10-in. extra high voltage suspension insulators. Weight savings will cut a 230 kv double-string deadend installation by 64 lbs. The lighter insulators simplify handling, transporting, and ease of changing the string.

Circle item #27 on reply card



Warning Light

A 30-in. chain attached to the battery cap of the Dietz Visi-Flash No. 610-FS ensures the flasher unit staying where it was put. Flag can be mounted atop the flasher to increase daytime effectiveness. With four standard D flashlight batteries signal life is 400 hours. Push button activates unit. Signal flash lasts $\frac{1}{10}$ sec. and pulsates 65 times a minute. Available with either red or amber lenses. By R. E. Dietz Co.

Circle item #29 on reply card

Reel Dolly

Magnesium Co. of America has produced a dolly for handling large reels of wire and cable with loading capacity of 2000 lbs, yet weighs only 33 lbs. Non-skid, raised pattern tread of approach apron provides safe easy mounting of reel dolly rollers. Adjusts for all reel sizes. The footlock, designed for positive control, gives simple, effective operation.

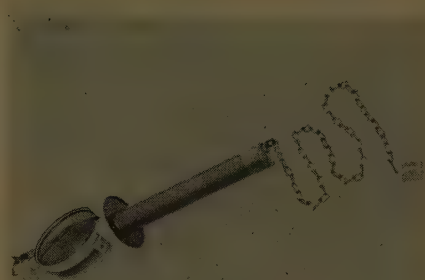
Circle item #28 on reply card



Elapsed Time Meter

Type BH-351 elapsed time meter, either with or without reset knob and mounted from either the front or back of the panel indicates the total time a particular circuit is energized, is suited for maintenance scheduling of equipment. Six register wheels are provided to indicate up to 99,999.0 hrs. Digits are white on black background except for tenths digit. Units are available from Westinghouse.

Circle item #30 on reply card



MAKE A "TEST CUT"

WITH BETTER



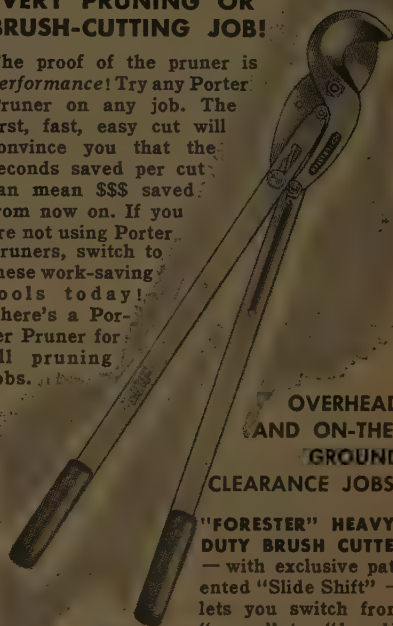
PORTER PRUNERS

AND DISCOVER
FASTER, EASIER
CLEANER

Pruning

A FINER TOOL FOR EVERY PRUNING OR BRUSH-CUTTING JOB!

The proof of the pruner is performance! Try any Porter Pruner on any job. The first, fast, easy cut will convince you that the seconds saved per cut can mean \$\$\$ saved from now on. If you are not using Porter Pruners, switch to these work-saving tools today! There's a Porter Pruner for all pruning jobs.



OVERHEAD
AND ON-THE-
GROUND
CLEARANCE JOBS!

"FORESTER" HEAVY-DUTY BRUSH CUTTER — with exclusive patented "Slide Shift" — lets you switch from "easy" to "hard" to "toughest" cutting simply by shifting the handle. Takes the place of 3 ordinary pruners. 2 sharp, fine-steel blades give quick-healing, clean cuts, make work easy for operator. 2 models — 0290F — Capacity 1½" green wood; 0390F — Capacity 2" green wood.



PORTER POLE PRUNERS for utility line clearance. 4 models — for all work. Lightweight model — short and long arm types, with and without pulleys. Cut up to 1" green wood. Available with Solid or Jointed Poles.



ASK YOUR SUPPLIER — or write us for the complete PORTER PRUNER catalog.

H. K. PORTER, INC.

Summerville 43, MISS.

KULJIAN...SPECIALISTS IN MODERN POWER DEVELOPMENT



Thermal, hydro electric, nuclear or internal combustion power stations and facilities.

For new stations, modernization or expansion . . . Kuljian offers multiple services from feasibility report through construction.

Over 30 years' experience in the power field. Write for brochure "Kuljian Engineering Makes the Difference".

ADDITIONAL KULJIAN SERVICES

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Pottheadless Terminations

A cable accessory kit for making hermetic pottheadless terminations on 15 kv paper-lead cable is available from Epoxylite Corp. Street cone preparation is conventional over this a laminate of special epoxy resin and orlon tape is constructed by simple, brush on techniques. Tests indicate life expectancy of over 40 years. Currently recommended for indoor use only although outdoor tests are being conducted.

Circle #31 on reply card



50 and 100 Kvar Capacitors

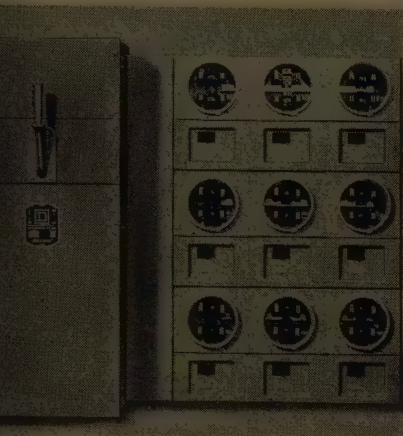
A 50 kvar capacitor and a 100 kvar "Slim Jim" capacitor, both offering spacesaving advantages as well as cool operation. Rated 2400 volts through 7960 volts, 60 cycle single phase with single or double bushings, the 50 kvar model has case size 15½ x 4½ x 22½ in. The 100 kvar model is 13½ x 4½ x 41 in. and is the only 100 kvar capacitor to meet horizontal NEMA mounting dimensions. By Cornell Dubilier.

Circle #32 on reply card

Multi-Metering Device

Freedom of arrangement and ease of installation are two advantages of the E-Z Stack concept of multi-metering devices by Square D Co. Basic meter-breaker devices can be easily stacked one on top of the other. Devices are bracket suspended and designed for precise integration into whatever combination is required to custom fit the available wall space and configuration. Individual units can be added as needed.

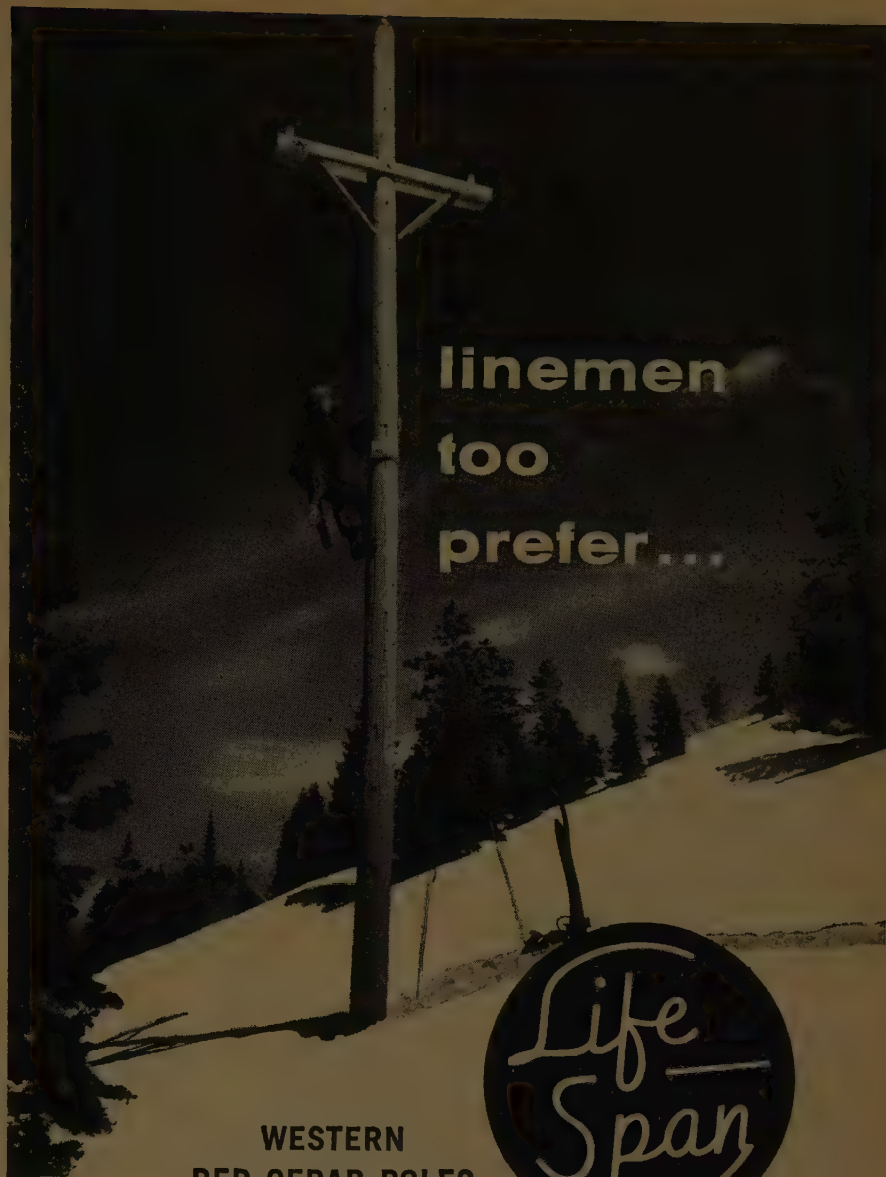
Circle item #33 on reply card



Open Drop-Out Cutouts

Two new 27-kv open drop-out cutouts have been added to the Hubbard and Co. Faultmaster line. New units feature same single-vent, all bore design as others in line. The new cutouts have a continuous rating of 100 amps, with either a 100 or 6000 amp interrupting capacity. Mounting brackets and fuse holders are available for both cutouts.

Circle item #34 on reply card



WESTERN RED CEDAR POLES



**They're Safe, Clean to Climb
and Deliver Many Added Years
of Trouble-free Service**

LIFE-SPAN Western Red Cedar Poles are clean and protected from top-to-butt. They are the result of years of continuous research and are **completely** immune to decay. To serve the utility industry better, Page & Hill maintains three mechanized yards with modern handling equipment. The LIFE-SPAN treatment applied to P&H poles complies with all approved E.E.I. or A.W.P.A. Thermal specifications.

When you buy—specify LIFE-SPAN Western Red Cedar Poles! They're your assurance of longer pole-line service at far less per annum cost.

PAGE & HILL, Inc.
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**EXTRA Holding Power
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EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

Moving Conductor Grounding

Ever-Ground, by the Paul S. Everley Co. provides constant grounding of moving conductors as they are pulled on a stringing job, protecting the lineman against a accidental energizing of conductors, severe burns and fatal shock. The unit snaps over the line at any point, without a threading through operation. One knob adjusts tension. The device is available for all sizes of conductors.

Circle #35 on reply card

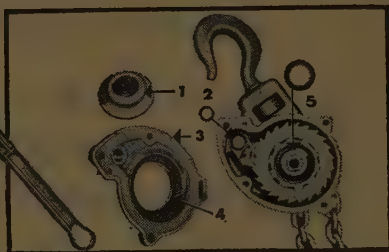


Integrated Collector

A medium capacity integrated collector system, designated the "C-Bar Conductor System," for use where load current requirements do not warrant use of high capacity integrated systems. Can be used for all types of a-c and d-c current collection on main runway and traveling cranes, materials handling equipment, etc. System is supplied complete with insulators, hangers, conductors, collectors, by Delstar Div., H. K. Porter Co., Inc.

Circle #36 on reply card

New Sealed Aluminum Hoist Line means easy lifting in any weather!



Efficient hoist performance is assured by sealing out moisture, oils, chemicals and dirt from the brake mechanism. Five seals provide permanent protection under exposure conditions.

Lifting is easy with the Coffing Sealed Disk Brake Lever Hoist because the handle pull to lift rated load requires only 57 pounds with the ¾-ton model to 93 pounds with the 6-ton model. Load spotting is precise—to within minute fractions of an inch. Sealed brake will not slip. Six models—¾ to 6-tons.

The high strength aluminum alloy frame is light—makes for easy portability. Ask your distributor or write for Bulletin ADH-78.

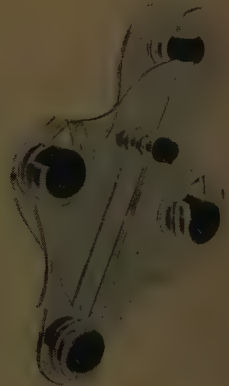
MA-15
¾-ton



COFFING HOISTS

DUFF-NORTON COMPANY

Four Gateway Center • Pittsburgh 22, Pa.



Aerial Spacer

The Tri-7 Hendri-Clamp, with conductors spaced equidistant on in. centers, will accommodate conductor sizes to 1½ in. diameter. Designed for use on aerial cable circuits above 9 kv, the spacer consists of identical halves of molded Plexiglas which are locked together by a single assembly nut and bolt. Split neoprene bushings have inside diameters to fit specific messenger and phase conductor. Hendrix Wire and Cable Corp.

Circle #37 on reply card

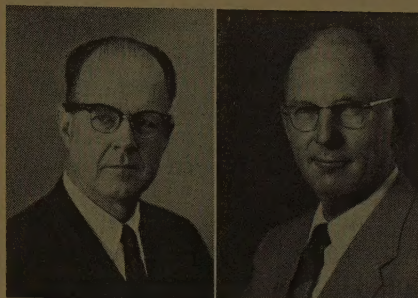
Two Elevated By Stone & Webster Service Corp.

The board of directors of Stone & Webster Service Corp. have elected Peter J. Rempe chairman of the board and chief executive officer and Lucius S. Storrs, Jr., president. The appointments were effective January 1.

Mr. Rempe has been president and Mr. Storrs executive vice president of the Service Corp., the management consulting subsidiary of Stone & Webster, Inc.

As chairman, Mr. Rempe succeeds Richard N. Benjamin, who became president of Stone & Webster, Inc., in 1959.

Mr. Rempe joined Stone & Webster in 1928 and was elected a vice president of the Service Corp. in 1939. He became senior vice presi-



Storrs

Rempe

dent in 1954, a director in 1957, and president in 1959.

Mr. Storrs went to Stone & Webster in 1933 and became a vice president of the Service Corp. in 1954. He was elected a director and executive vice president in 1959.

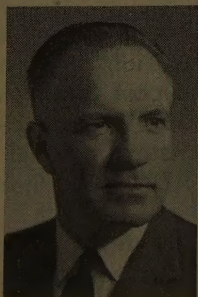
PSE&G Elects Freer

Frank Freer, Jr., has been elected vice president and comptroller of Public Service Electric and Gas Co., according to an announcement made by Donald C. Luce, president.

A graduate of New York University, Mr. Freer began his career with PSE&G in 1920 as a bookkeeper. He was promoted to assistant chief accountant in 1935, chief accountant in 1945, assistant comptroller in 1950, and comptroller in 1957.

Hayward Elected President of Atlantic City Electric

The board of directors of Atlantic City Electric Co. have elected James P. Hayward president of the company, succeeding Charles H. Hanan who resigned recently due to reasons of health.



Lanphier To Head F-M

Thomas G. Lanphier, Jr., has been elected president of Fairbanks, Morse & Co. He is a 45-year old industrial executive with extensive experience as an administrator of research and development projects for both government and industry.

As president of Fairbanks, Morse & Co., Mr. Lanphier will continue to serve as a vice president of the parent company, Fairbanks Whitney Corp.



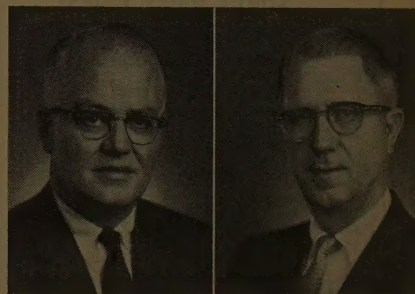
CIPS Names Two

The board of directors for Central Illinois Public Service Co. have elected George R. Cook vice president in charge of finance and secretary of the corporation. He succeeds H. M. Parker, who retired.

Mr. Cook has served as treasurer and assistant secretary since 1958.

C. C. Bredehoft, former assistant treasurer, was elected to succeed Mr. Cook as treasurer and assistant secretary.

A native of Springfield, Ill., Mr. Cook joined CIPS in 1929 as an accountant and traveling auditor. He was named assistant treasurer in 1951, becoming treasurer seven years later.



Cook

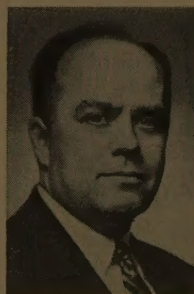
Bredehoft

Mr. Bredehoft started to work for CIPS in 1931, serving as an accountant and traveling auditor until 1935, when he was named auditor for the company's southern division. He was elected an assistant treasurer in 1940.

Hevi-Duty Appoints Nordstrom

Hevi-Duty Electric Co. has announced the appointment of Raymond G. Nordstrom to the newly-created post of executive vice president, with responsibilities primarily for the marketing function.

Mr. Nordstrom formerly served as executive vice president and general manager of the Refestal Corp., a subsidiary of Borg-Warner Corp.; assistant to the president of Ingersoll Products, and manager of market development for the Tor-sion-Balance Co.





"Man, dig these sturdy Haley poles!"

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Light in weight and clean. PENTACHLOROPHENOL treated in our modern plant for protection against decay, moisture and insect damage.



TWO strategically located yards:

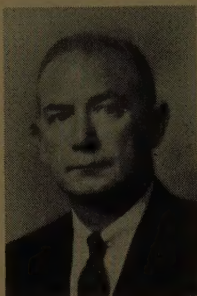
MINNEAPOLIS,
MINNESOTA
FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

Southern Co. Elects Executive VP: Announces Changes

James F. Crist has been named executive vice president of the Southern Co. He has been a vice president since 1947 and a director since 1949.

Succeeding Mr. Crist as head of the company's Birmingham office is T. Hunt Vaden, also a vice president.



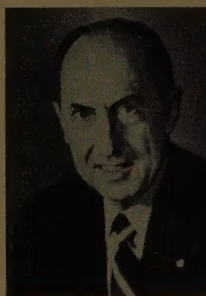
Mr. Crist is also president of Southern Electric Generating Co., which is now completing construction of a million kw steam plant on the Coosa River. He will be succeeded by Alvin W. Vogtle, Jr., a Birmingham attorney.

Originally entering the utility business Alabama Power Co., Mr.

Worthington Ups Feldman, Marshall

Walther H. Feldman, president of the Worthington Corp., has been named chief executive officer by the board of directors. He succeeds Hobart C. Ramsey, chairman and formerly executive officer.

Mr. Feldman, who was with Worthington's subsidiary, Electric



Feldman



Marshall

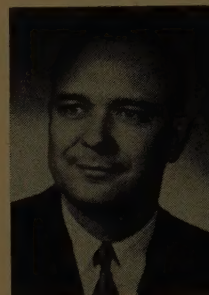
Machinery Mfg. Co. of Minneapolis, first joined the company as vice president-sales in 1950. He became executive vice president in 1955 and was elected president and a director in 1957.

At the same time, Robert E. Marshall, secretary and general counsel of the company, was named treasurer. He succeeds W. R. Shook, who resigned recently to become treasurer of Avon Products, Inc. He was named secretary in 1949 and general counsel in 1955.

Crist joined South Carolina Power Co. in 1928, becoming a vice president in 1941. He was president of Gulf Power Co. from 1948 to 1956. In 1957 he was elected president of Southern Electric Generating Co.

Mitchell and Caruthers Elected

Central Transformer Corp., of Pine Bluff, Ark., has announced the election of Ralph C. Mitchell, Jr., to the office of executive vice president and John E. Caruthers to the office of vice president.



Caruthers



Mitchell

Mr. Mitchell joined Central Transformer in 1953 as sales manager and was elected vice president and a director of the corporation in 1955.

Mr. Caruthers went to the company in 1955 as sales engineer and became assistant sales manager in 1957. He was appointed sales manager in mid-1958.

Men of Power Briefs

UTILITIES

Philadelphia Electric has announced the appointment of **Henry R. Flanagan** as manager of its Philadelphia division and customers service department.

Also at Philadelphia Electric, **R. S. Diggs** has become assistant superintendent of the transmission and distribution engineering division, filling the post of the late **G. H. Jarden**. **R. L. Cole** succeeds Mr. Diggs as assistant general superintendent of T&D in the Philadelphia division.

Clayton S. Cronkright has been made general manager—area de-

velopment of Public Service Electric & Gas Co.

James S. Currie, retiring Commissioner of Revenue for the State of North Carolina, has joined Carolina Power & Light Co. as assistant to the treasurer of the company.

Melbourne A. Forrest, vice president of Burns and Roe, Inc., has been elected to the company's board of directors. He is responsible for the firm's project operations in power, nuclear and industrial fields.

Detroit Edison's new assistant to the general accountant is **J. Douglas Elliott**, former director of central data processing. He is succeeded by **Albert J. Gebauer**. Pacific Gas and Electric Co. has announced that **Robert J. Owens**, safety administrator, has been promoted to safety engineer. He succeeds **Warren S. Hyde**, who retired December 31.

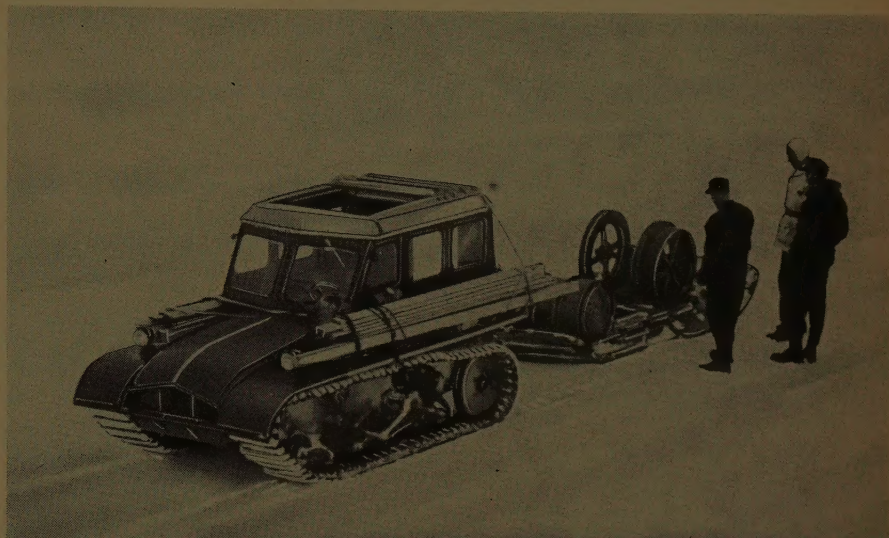
J. Wesley Lewis has been named manager of Duke Power Co.'s Durham district, succeeding **Earl C. Dameron**, who has retired. Also at Duke Power, **J. A. Jones, Jr.**, has been promoted to manager of the transportation department and **Edmund M. Diaz, III**, has joined the company's personnel department as supervisor of training.

A 27-year veteran with Carolina Power & Light Co. has been named assistant to the president. **Donald K. Fry**, formerly an engineer in the rate department, thus succeeds the late **William L. Yoder**, corporate secretary, in the handling of many corporate functions.

Six men have been promoted at Georgia Power Co.: **Joe B. Hudson** has been named Athens division auditor; **A. H. Lewis** has been promoted to assistant comptroller; **Evan B. Guth**, has been elevated to the post of district engineer in the Manchester division, replacing **J. Lee Harrell**, who has been promoted to district superintendent at Tifton; **Cornelius Lumsden** replaces Mr. Guth as district sales engineer at Manchester; **Francis H. Williams**

has been named to the newly-created post of assistant division engineer in Columbus.

SALES POSITION OPEN—Established and growing manufacturer of T&D accessories requires Regional Salesman with electric utility experience to service sales reps and customers in Ill., Mich., Wisc., Ia. and Ind. area. Salary with bonus. Prefer age 28-35. Send resume, photo, references and requirements to Box 2161, ELECTRIC LIGHT & POWER, 6 No. Michigan Ave., Chicago 2, Ill.



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- For travel over deep snow or muskeg—because it has only $\frac{3}{4}$ lb. per sq. in. ground pressure.
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- With comfort—in a heated cab, roomy enough for the driver and six passengers.
- Economical, too—because of the Volkswagen engine.

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MEASURES DOWN TO ONE MICROHM!

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CALENDAR OF EVENTS

January 29-February 3—American Institute of Electrical Engineers, Winters General Meeting, Statler Hotel, New York, N. Y.

February 1-2—Edison Electric Institute, Commercial Cooking and Water Heating Committee, Atlanta, Ga.

February 2-3—Pennsylvania Electric Association, Prime Movers Committee.

February 5-7—National Association of Purchasing Agents, Public Utility Buyers Group, Detroit, Mich.

February 8-9—Pennsylvania Electric Association, Transmission and Distribution Committee, Penn Harris Hotel, Harrisburg, Pa.

February 9-10—Pennsylvania Electric Association, Systems Operation Committee, Harrisburger Hotel, Harrisburg, Pa.

February 13-16—American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Annual Meeting

and 15th International Heating and Air-Conditioning Exposition, International Amphitheatre, Chicago, Ill.

February 16-17—Pennsylvania Electric Association, Engineering Section, Electrical Equipment Exposition, Pick-Roosevelt Hotel, Pittsburgh, Pa.

February 23-25—National Wiring Bureau, 17th Annual National Wiring Sales Conference, Sherman Hotel, Chicago, Ill.

March 5-8—Third Annual Lighting Exposition, World Lighting Forum, New York Coliseum, New York, N. Y.

March 5-9—American Society of Mechanical Engineers, Sixth Annual Gas Turbine Conference, Shoreham Hotel, Washington, D. C.

March 9-10—AIEE, IAS, IRE, Second Symposium on Engineering Aspects of Magnetohydrodynamics, University of Pennsylvania, Philadelphia, Pa.

March 21-23—American Power Conference, Sherman Hotel, Chicago, Ill.

March 27-29—Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla.

April 6-7—American Society of Mechanical Engineers, Management Engineering Conference, Statler Hilton Hotel, New York, N. Y.

April 6-7—Pacific Coast Electrical Association, Engineering and Operating Section, Ambassador Hotel, Los Angeles, Calif.

April 17-18—Pacific Coast Electrical Association, Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif.

April 27-28—Pacific Coast Electrical Association, Administrative Services Section, Villa Hotel, San Francisco, Calif.

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